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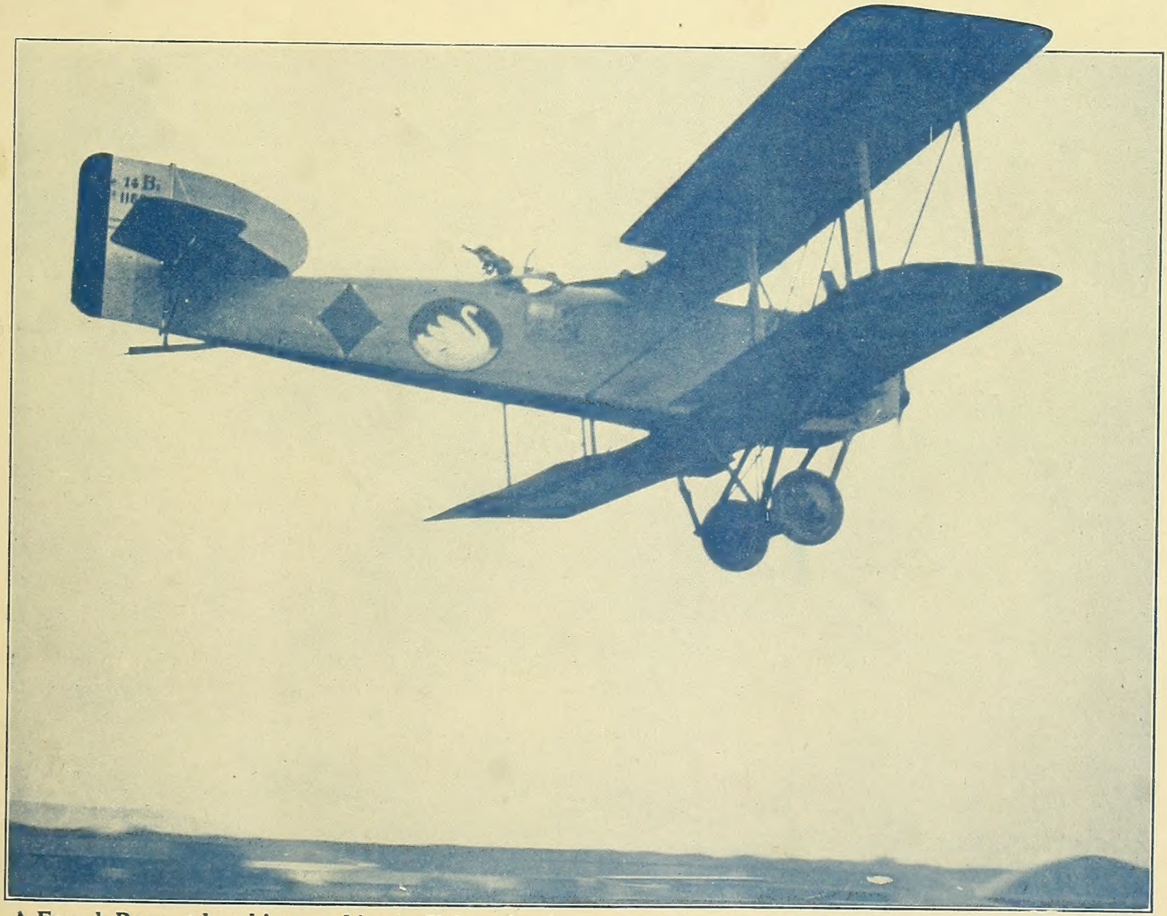
AERIAL AGE WEEKLY

Vol. 7, No. 5 APRIL 15, 1918 10 CENTS A COPY



A French Breguet bombing machine in flight. On the rear can be seen twin Lewis guns mounted for use of the aerial photographer or observer.

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LET US STOP DEALING WITH MINIMUMS

By ALAN R. HAWLEY, President, Aero Club of America

OUR aeronautic accomplishments in the first year of war consist mainly of things that we have learned (let us hope) through experience and mistakes.

Let us hope that we have learned the size of the task of defeating Germany and the fallacy of relying on minimum.

As we look back to this one year of experience we see that the air program was not equal to the task of whipping Germany through the air.

The greatest of our national sins in the past year has been over-reliance on minimums—minimum plans, based on minimum understanding of the military situation, further weakened by minimum appropriations. We have also had some minimum men, having minimum knowledge and experience, who did not anticipate, as one must do in war times, the possible necessity of quick expansion, as well as possible delays, due to transportation of materials, labor conditions, mistakes, etc.

The one national resolution that we ought to make on the first anniversary of our entrance in the war should be to eliminate minimums of all kinds and adopt maximums in programs, men, appropriations, manufacturing facilities, etc. Having adopted maximums, let us add to each so as to have a substantial margin of safety to insure success under any circumtances.

The Air Program of July, 1917, was the rock-bottom plan made when Italy was victorious and Russia was still fighting.

It was based on the assumption that the Allies had Germany practically beaten and only needed some assistance to complete the task.

This program did not take into consideration that it takes an average of two aeroplanes to give an aviator the one hundred hours of preliminary and advanced training needed to make him fit for the present-day highly specialized work of a military aviator. Nor did it take into consideration that it takes close to one hundred per cent. replacements per month in aeroplanes and motor to keep aviators equipped for fighting. Nor did it take into consideration that it takes forty per cent. replacements in aviators per month to keep up the fighting personnel of aero squadrons.

In making this program the fact was overlooked that if the plan was to keep five thousand American aviators at the front, it was necessary to train twenty-five thousand. Therefore there would be required fifty thousand preliminary and advanced training aeroplanes with which to train them speedily. The number of aeroplanes under construction today is not sufficient to even give the preliminary and advanced training to the number of aviators the United States must supply within the coming twelve months.

There was also overlooked the fact that to keep five thousand aviators equipped for action, there would be required a rock-bottom minimum average of two thousand aeroplanes of different types per month, or a total of twenty-four thousand machines of different types during the twelve months.

Having overlooked these very important considerations, the authorities could not undertake to supply all the aeroplanes needed out of the twenty-two thousand planned in the July, 1917, program, to be completed by July, 1918. The Italian and Russian reverses created imperative needs, and the authorities received cables requesting thousands of aeroplanes of diffrent types. Lacking the funds necessary to place additional orders, the authorities changed the orders of aeroplanes under construction which they placed, so as to meet the requests from France. As the requests from France and the suggestions from the different Allies were different types of machines, the authorities kept on changing the orders, so as to supply those machines for which there seemed to be the most pressing need. This led to the continual changes which caused the setbacks which have resulted in the aircraft program—which is still the same program made at the time when Italy was victorious and Russia was still fighting—being behind by several months.

Had the authorities been in a position to place additional orders whenever they received cables asking for a given number of machines of a given type, instead of having to change orders for machines under construction, today the original program would be nearly delivered and an additional program would be well under way.

Today we are making the same mistake that was made then. We are stopping the enlisting of aviators, and no steps have been taken to extend the program to meet the new conditions which have arisen, and which, unless they are met properly, may result in Allied reverses.

We have followed the aircraft program step by step and are familiar with the inside problems that have caused the delays. These causes are numerous, but the main ones are:

(1) Lack of concentrated responsibility, authority and control in the management of aerial matters.

(2) Lack of sufficient appropriations to extend the aircraft program to meet the military needs of the Allies.

(3) Lack of touch between the authorities dealing with the strategic side of the war and the authorities having charge of the supplying of aircraft and aviators needed to build American and Allied forces.

(4) The lack of a Government department having the authority and organization necessary to deal with all aircraft matters and prevent delays due to division of responsibility, bureaucratic jealousies and official squabbles over matters of departmental jurisdiction, duplication of efforts, etc. The present Aircraft Board is only an advisory board and has no power to act or to get the necessary organization to extend or carry out an extended aircraft program.

To correct the situation, two successive steps must be taken, as follows:

(1) The immediate appointment of an Assistant Secretary of War and an Assistant Secretary of the Navy to represent the Army and Navy, respectively, in the Aircraft Board. This is to solve the immediate problems while the second step is being taken.

(2) The creation of a Department of Aeronautics based on the British plan, which places the Air Services under a separate Department of Aeronautics, the head of which is independent of, although co-operating closely with, the War and Navy Departments.

The British Government went through every one of the troubles we have gone through in connection with our air service. The official reports of the investigation of the British

Air Service in 1916 shows that there were scandals and charges, counter-charges and confusion, just as we have in the United States today. After three years of trying different plans, the military and naval authorities and other branches of the British Government came to the conclusion that the only solution was a separate Department of Aeronautics, with an Air Minister at the head, whose functions are identical with the duties of the War Minister and the First Lord of the Admiralty.

A separate Department of Aeronautics is the only solution to all the problems of building the air forces needed to win the war.

We must see that many of the officials in charge of the aircraft program and the members of their staffs are able men who, if placed in a Department of Aeronautics and given the power necessary to act and to get together an efficient organization and the necessary funds, will quickly save the situation and enable the United States to do its share in the air this year.

It is well to add that an important consideration that led to the creation of the Air Ministry in Great Britain was the knowledge that Germany is planning extensive aerial mail, express and passenger transportation lines, to employ the output of her aircraft factories after the war. Germany's plans are extensive enough to employ tens of thousands of aircraft. This would give her a reserve air fleet large enough to blow England, France or Italy off the map overnight.

As was brought out in the House of Commons by Lord Montague, aircraft can be turned from vehicles of transportation to war machines by the simple process of substituting bombs as cargo. A nation that overlooks this fact may pay dearly for its oversight.

We all hope, of course, that some agreement may be reached between the nations which will guarantee against such a horror as the bombing of a nation out of existence overnight by another nation having tens of thousands of aeroplanes. But the present war has shown that hope does not save nations from the outrages of aggressors. As a matter of fact, Germany's first air raids of Great Britain were conducted by Zeppelins, which were employed for passenger carrying before the war. So while keeping our hearts in the right place, we must be ready to protect the Republic and the rights of humanity and the Cause of Civilization. To do this will require direct control and supervision of military and commercial air fleets, and this can only be done by a well organized Department of Aeronautics.

Let us emphasize again the necessity of making a national resolution to eliminate minimums of all kinds and adopt maximums in programs, men, appropriations, manufacturing facilities, etc. Having adopted maximums, let us add to each so as to have a substantial margin of safety to insure success under any circumstances.

BELMONT PARK IS LANDING FIELD FOR MAIL SERVICE

BELMONT PARK in New York, Potomac Park in Washington and Bustleton, north of Philadelphia, have been selected by the Postoffice Department for landing fields for the aerial mail service to be inaugurated between the three cities next month. The work of preparing the fields and erecting the hangars will be pushed as rapidly as possible, assuring the inauguration of the service at the latest by May 15, it was officially announced.

The tentative schedules announced by the Postoffice Department give New York the benefit of greatly improved mail service. An aeroplane leaving Washington at noon, as now planned, will reach New York in time to permit a late afternoon delivery throughout the city. To make this delivery by train letters now have to be mailed here before 9 A. M.

The Postoffice Department's official announcement of the new service says:

Work to Be Rushed

"The three landing fields for the aerial mail service have now been selected, and the work of preparing the fields and erecting the hangars will be pushed as rapidly as possible. The service will be in operation not later than May 15. The date of its inauguration may be advanced considerably.

"The three landing fields selected are Potomac Park, for Washington; Bustleton, North Philadelphia, for Philadelphia, and Belmont Park for New York.

"Difficulty was experienced in the selection of a landing site in New York, on account of the high rental asked for a suitable property. The Westchester Racing Association, in a spirit of patriotism, tendered Belmont Park to the Government for this purpose free of charge, and the offer was accepted.

"The hangars at Potomac Park are now in course of construction and the work at Bustleton and Belmont Park will be speedily begun. Extensive rolling and grading of the Philadelphia field is necessary, but the work will all be done during this month.

"Assuming that the aeroplanes leave New York for Washington at noon and leave Washington at the same hour for New York, rail connections for destinations beyond these cities and Philadelphia will be made which would otherwise be impossible.

Much Time Saved

"Besides the saving of much time in the delivery of letters addressed to New York, Philadelphia and Washington, there will be a large time saving through making these connections for earlier trains to the points beyond the terminals. An aeroplane leaving New York at 12 noon, arriving at Philadelphia at 1:30 and at Washington at 3:30, will connect with earlier trains than those conforming to the train schedules from New York for Camden, Atlantic City, N. J.; Paoli, Lancaster, Harrisburg and Chester, Penn.; Wilmington, Del.; Point Deposit, Md.; Cape May, Reading and Pottsville.

Mail arriving at Washington by airoplane at 3:30 would make connections with the Baltimore & Ohio train leaving Washington at 4 P. M. for Cumberland, Grafton, Pittsburgh, Cincinnati and St. Louis. It would also make connection with the Southern train leaving Washington at 4:15 P. M. for Charlottesville, Lynchburg, Danville, Va.; Greensboro, Salisbury and Charlotte, N. C.; Atlanta and Birmingham.

To Gain Eight Hours

"The time saved on these connections would amount to eight hours or more. In order to make these connections by rail it would be necessary for mail to be dispatched from New York at 8 A. M.

"On account of the more frequent train service and different schedules of trains going north the saving of time would not be as great to outlying stations for northbound mail.

"Letters dispatched by air route from Washington will at Philadelphia connect with earlier trains for Trenton, Manunka Chunk, N. J., and East Stroudsburg, Chester, Wilmington, Camden, Atlantic City, Cape May, Reading, Pottsville and Bethlehem.

"At New York earlier connections will be made for Bridgeport, New Haven, Springfield, Boston, Albany, Syracuse, Rochester, Buffalo, Cleveland, Toledo, Elkhart and Chicago.

"An aeroplane leaving Washington on this noon schedule would make the late afternoon city delivery over the entire City of New York. To make this delivery by train letters now have to be mailed before 9 A.M."

"Belmont Park is the ideal New York terminal of the Washington-New York aeroplane mail line," said Messrs. Alan R. Hawley, President of the Aero Club of America and Henry Woodhouse, a member of the Board of Governors of the Club, "and the postal authorities are to be complimented on their wise selection."

"The Aero Club authorities selected Belmont Park in 1910 for the first international aviation meet and found it ideal in every way. By offering the use of Belmont Park to the postal authorities, Major August Belmont, who is an old member of the Aero Club of America, again demonstrates his practical patriotism. This is only one of the many contributions which he has made to advance the cause of national defense in aeronautics.

"The aerial mail carrying project is much closer to the cause of national defense than many people realize. Had the postal authorities been permitted to establish aerial mail lines several years ago, it would have given great impetus to the development of large mail carrying aeroplanes and high-powered motors and we would today have extensive sources of supplies of these machines with which to strike Germany through the air.

"There would also have been trained hundreds of aviators in cross-country and night flying, which would have given a reserve of trained aviators to use against Germany upon our entry into the war.

"It is highly gratifying that the War Department will co-operate to the fullest extent with the Post Office in rushing these aerial mail lines, using military aviators to pilot the postal aeroplanes, thereby giving the aviators extensive cross-country flying.

"It is an efficient combination, which will develop trained aviators, and at the same time enable New York, Philadelphia, Washington, Camden, Atlantic City, Harrisburg, Wilmington, Boston, Albany, Buffalo, and other cities to get their mail many hours sooner.

"The fact that this one air line increases the efficiency in the delivery of mail in so many cities gives an idea of the efficiency of the aerial mail service and insures establishing other aerial mail lines throughout the United States in the near future.

"There are thousands of aviators who still have to receive their advanced training, and whose training can be combined with the delivery of mail in different parts of the United States."

The News of the Week

New Department of Aeronautics is Probable Now

Washington. — Sentiment in Congress is growing fast for a "Department of Aeronautics."

In fact it is more than likely that a bill soon will be introduced providing for such a department with a secretary at its head who will have the same standing as a cabinet officer and authority as both the Secretary of War and the Secretary of the Navy.

Under the present system the Aircraft Production Board may only make recommendations to either the War or Navy Departments which may or may not be carried out in the Signal Corps of the army or the Naval Aviation Service.

Under the proposed department scheme the men now in these two branches of the service would be transferred to the "Flying Corps," which would be a consolidation of both.

When Murray Hulbert, Dock Commissioner of New York, was a member of the House he introduced a bill for the creation of a Department of Aeronautics, but it met with the disapproval of the Administration and was lost. However, it was due to that bill to a large extent that the present Aircraft Production Board was created.

President Names New Aids to Baker

Washington.—President Wilson sent to the Senate April 8 the nominations of Edward R. Stettinius and Frederick F. Keppel, both of New York, to be Assistant Secretaries of War. They will fill two new offices created to carry out plans for placing the War Department on a better basis to carry on the conduct of the war. Both nominations had been forecast.

Mr. Stettinius was a partner in J. P. Morgan & Co., and as such had charge of the purchase of war supplies for the Allies in the United States before the United States entered the war. He is now Surveyor General of Purchases under the Director of Purchases in the War Department. Senators who favored the creation of a War Cabinet of three members cited Mr. Stettinius as the kind of man needed for that proposed body. Dr. Keppel is Dean of the College of Columbia University, New York. He has been a voluntary assistant to the Secretary of War and one of Secretary Baker's most intimate official associates.

Industrial Service Section of Signal Corps Is Created

The War Department authorized the following statement:

The appointment of Charles P. Neill, of Washington, D. C., manager of the Bureau of Information, Southeastern Railways, and former United States Commissioner of Labor, as chief of the Industrial Service Section of the Signal Corps, and of W. Jett Lauck, of Washington, D. C., editor of the *Labor Gazette,* and former mining expert and consulting statistician of the United Sattes Commission on Industrial Relations, as his assistant, completes the War Department's program of creating in each important procuring bureau an organization for the development and maintenance of satisfactory relations between employers and employees engaged in production for the Army.

The sections organized are:

Industrial Service Section of Ordnance Bureau, in charge of Herman Schneider; location, Sixth and B Streets; telephone, Main 2570, branch 449.

Industrial Service Section of Quartermaster Department, in charge of E. M. Hopkins; location, 1800 Virginia Avenue; telephone, Main 2570, branch 2396.

Industrial Service Section of Signal Corps, in charge of Charles P. Neill; location, 161 Woodward Building; telephone, Main 3670.

Industrial Service Section of Construction Division, in charge of Col. J. H. Alexander; location, Seventh and B Streets; telephone, Main 2570.

The work of these sections is being carried on in close co-operation with the Department of Labor and is being co-ordinated through the office of the Secretary of War with the Labor Administration.

Approves St. Louis-Chicago Aerial Route

Postmaster Selph of St. Louis announced that the Postoffice Department had approved his idea for aerial mail service between St. Louis and Chicago, provided suitable landing fields can be found in the two cities. Aeroplanes would leave Chicago and St. Louis simultaneously.

Colonel Montgomery Made Member of General Staff

By direction of the President, Colonel Robert L. Montgomery is detailed as a member of the General Staff Corps for the period of the present emergency. Colonel Montgomery, while discharging this duty, will continue as a member of the Aircraft Board.

Evan J. David Lectures to Baltimore Engineers

Evan J. David, business manager of "Flying" monthly, addressed the Engineers' Club of Baltimore on April 4. Mr. David touched on all phases of aeronautics, beginning with the construction of the aeroplane in the factory, and ending with its destruction over the field of battle.

Wright Buys Indiana Plant

The Wright Aeroplane Company of Dayton, Ohio, has purchased the plant of the Union City Body Works of Winchester, Indiana. This plant will be used for the manufacture of aeroplane parts. Two hundred and fifty men will be employed here.

Standard Aeroplane Gets to Capital in Record Time

A new National biplane flew from Dayton, Ohio, to Washington, a distance of over 700 miles over mountainous country, in little more than eight hours. The aeroplane was constructed by the Standard Aircraft Corporation, equipped with a Hispano-Suiza engine and piloted by R. Bounds.

Navy Uses Liberty Engine

According to information from Washington, the Navy Department has more than 80 aeroplanes equipped with Liberty engines. A Liberty equipped plane on March 28, attained an altitude of 21,500 feet. Announcement was also made, according to "Automotive Industries," that General Pershing has well over 100 combat aeroplanes in his organization. It is not stated, however, that they are of American construction.

At the Aviation Schools

Changing a spark plug in mid-air, while flying near the Curtiss School at Miami, is the feat performed by Joseph Bennett and Paul Bickey. The plug was changed at an altitude of 8,000 feet and flight resumed in less than four minutes.

Richard Mansfield, son of the late Richard Mansfield, who enlisted in the Aviation Section of the Signal Corps in New London, Conn., on February 1 last, died of spinal meningitis at the aviation training camp, San Antonio, Texas. His mother, who was Beatrice Cameron, an actress of distinction, has been so informed.

With Washington as their final destination, Brigadier-General W. L. Kenley, chief of the United States Army air forces, and Major C. K. Rhinehardt, his pilot, prepared to leave Kansas City for Omaha, where the General will inspect the army balloon training camp. The General is making a round of all army aviation camps by aeroplane.

"Simply travelling that way to save time," he said when he and his pilot alighted here after flying from Fort Sill, Oklahoma. They had flown there the day before from San Antonio, Texas.

Rodman Law, balloonist and aeronaut, attached to an aero squadron at Kelly Field, jumped from an aeroplane at a height of 2,500 feet, and with the aid of a parachute, landed safely. He was taken up in an aeroplane by Edward Stinson, an instructor at Kelly Field. Law is making a series of experiments to demonstrate the feasibility of jumping from an aeroplane. He is a brother of Miss Ruth Law, and Edward Stinson is a brother of Miss Katherine Stinson.

A record has recently been established at the San Diego flying field, where the cadets in training there flew a distance of 35,000 miles in 72 hours without breaking so much as a support on any of the machines.

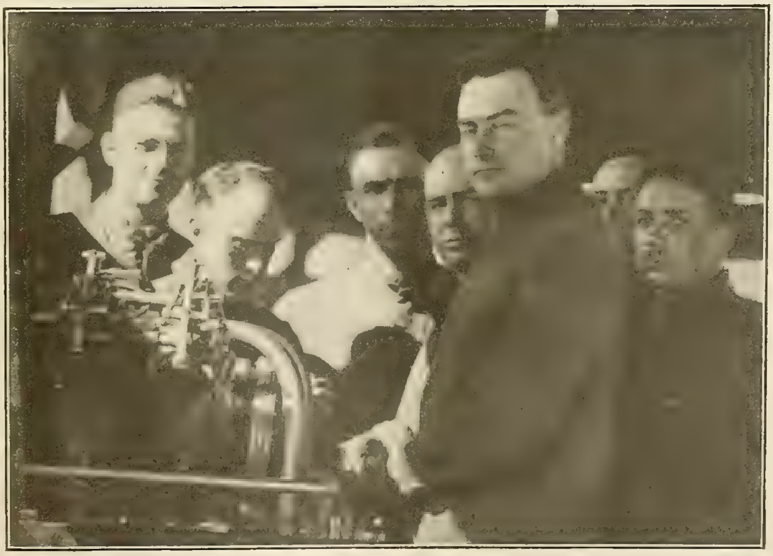
Royal Flying Corps Going Back to Canada

The British Royal Flying Corps, commanded by Brigadier-General Hoare, which has been training here since October, will soon be starting back to Toronto, Canada. The British, thousands strong, came to Fort Worth and shared the three American fields here at the invitation of the United States Government. It was a return courtesy for the British invitation last summer to the Americans to train in Canada.

The British will not return to Canada in one body—the movement extending over ten days. After the men in the fields have moved out the headquarters staff will go. With the departure of the English, the fields here will be devoted to Americans.

Liberty Motors Being Shipped Abroad

According to "Automotive Industries", 150 Liberty aeroplane engines were shipped abroad during the past week, and more than seventy had been delivered ready for installation, previous to that time.



Major John Purroy Mitchel, former Mayor of New York City, receiving aero engine instruction at an Army flying field

Aeroplanes Aid Liberty Loan

The big Caproni Italian military aeroplane, piloted by Captains Resnati and D'Annunzio, of the Italian Flying Corps, came to Washington from Mineola, N. Y., "bombing" New York city, Princeton, N. J.; Philadelphia and Baltimore on the way with Liberty Loan literature. The officers will remain in Washington a week to aid in the loan campaign. The Captain's machine was accompanied to New York by six American planes, in charge of Lieutenants E. L. Williams, Charles Ludick, E. B. McCullough, E. O. Barr, H. E. Watson and E. W. Kilgore.

The air fleet made its "raid" on Manhattan under the bluest of skies, raining "buy a bond" paper bombs from the financial district clear up to and beyond the Bronx. The air was filled at times with fluttering papers, which looked not unlike autumn leaves tossed about by the winds. Eager spectators even risked injury by surface cars in efforts to clutch the "bombs" before they could touch the ground.

Captain Resnati in his big Caproni caused all to marvel. He circled high above the Woolworth tower and then took a whirl around one of the American machines before he descended to a point north of City Hall Park and skimmed gracefully over the City Hall, doing a ring above the park.

Then he took a higher air path and zipped along the upper strata of Broadway, dropping Liberty bond literature as he flew.

The American aircraft returned to Mineola in single file after flying above and circling high in the air over the city.

Lieutenant Joseph C. Stehlin, twenty-one years old, who, as the youngest member of the Lafayette Escadrille, on Setpember 7 last, fought three Boche battleplanes 17,000 feet in the air behind the Prussian lines, brought down one of them, disabled another and reached his home station in safety, is going to make a series of flights over the State of New York for the Third Liberty Loan.

Instead of firing a machine gun or dropping bombs to destroy Boches he will scatter thousands of Liberty Loan circulars to arouse the people to buy, buy, buy, and keep on buying.

Lieut. Colonel Vincent on Duty at Dayton

The Signal Corps, Aviation Section, has assigned several of the engineers who were identified with the design of the Liberty motor to duty in Dayton, Ohio, with orders to report to Lieut. Colonel Vincent, Mutual Building, Dayton. Among the officers ordered to report are: Major Howard C. Marmon, Capt. Floyd O. Tobey, Capt. Howard E. Blood, Lieut. Ferel O. Replogle, Lieut. Paul Goldsborough, Lieut. T. C. McMahon, Lieut. William Bernhard, Lieut. Maurice S. Shafer, Lieut. Ernest A. Cawcutt, Lieut. Sam L. Roche, Lieut. Miller B. Heebner, Lieut. Francis E. Engerbretson and Lieut. Lionel M. Woolson and Major Alfred Smith.

Red, White and Blue Circles and Stripes to Distinguish American Machines

Red, white and blue circles and stripes will be the distinguishing mark of Uncle Sam's army and navy aeroplanes, the Signal Corps announced.

The wings of the planes will be marked with a red bullseye. The rudders will be marked with vertical red, white and blue stripes.

Major Hitchcock Commands at Minoela

Within one year from the time he first started taking lessons on the field of flying Major Thomas Hitchcock has been put in command of Field No. 1. Major Hitchcock soon developed into one of the best aviators here. His progress won him his license, this was followed by a commission, and within a short time he was made a captain. His ability asserted itself in many ways and he was promoted to a major. He has now been put in supreme command of all the men at the field, where but so short a time ago he was a beginner.

Major Hitchcock had proved an exceptional scholar. There never was a day when the weather was too cold or windy for him to fly. The only thing left to make his happiness complete now is to receive word that his seventeen-year-old son, Thomas, who was downed by a German some time ago in France, is alive and in a prison camp.

Major Hitchcock replaces Lieutenant Colonel Olin Aleshire, who has been assigned to other duties.

Major Rice Heads American Airmen in Battle

Major Cushman A. Rice, of Willmar, Minn., son of a former Minnesota Lieutenant Governor and member of the Aero Club of America, is commanding the American fliers now operating against the Germans in the great battle in France, according to reports reaching here from the front.

Major Rice has been in France only about a month. Washington friends were greatly pleased to learn of the honor conferred on him. They recalled that he repeatedly was turned down by the War Department last spring when he applied for a commission. He was told he was too old, too big to fly and otherwise unfitted for the service. He served in the army in the Spanish-American War. He fought in South American revolutions, was chief of scouts for General Lawton in the Philippines and took part in putting down the Boxer uprising.

Major Rice finally gave up and enlisted as a "buck" private. Throught the efforts of Senator Knute Nelson the War Department finally waived ground school requirements and sent Private Rice to Mineola Flying Field, where he soon became a sergeant and then graduated several weeks ahead of his class. He was recommended for major by the commander of the flying corps, who at that time said he wanted Major Rice for important work in France.

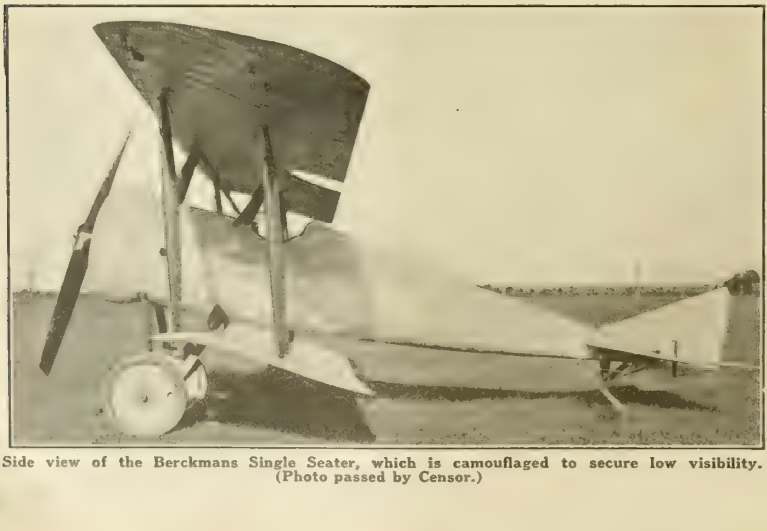
Before going to Europe Major Rice spent sixty days arranging business affairs in Cuba, where he owns a ranch and rice plantation.

Aviation Corps of 500 to Be Contribution of Siam to Allied Cause

An aviation corps of 500 members will be Siam's contribution to the Entente Allies, according to Frank D. Arnold, formerly chargé d'Affairs at Bangkok, who arrived at San Francisco from Siam on his way to Washington.

"The Siamese army has developed some splendid aviators," Mr. Arnold said. "They seem to take naturally to the work under the instruction of French and Italian experts.

"When I left they were preparing to send over 500 men with a complete quota of aeroplanes, all of foreign construction."



Side view of the Berckmans Single Seater, which is camouflaged to secure low visibility. (Photo passed by Censor.)

Carolina Aircraft Company Organized

The Carolina Aircraft Company of Raleigh was recently incorporated with an authorized capital of $500,000 and a paid capital of $20,000. The stockholders are Harry N. Atwood, famous pioneer aviator; Howard White, John A. Park and J. M. Broughton. The first craft is to be completed in sixty days.

Reorganization of War Industries Board

Washington.—Under a plan of reorganization announced April 7 by Chairman Baruch of the War Industries Board, the ordering and delivering of war supplies and the management of the big industrial problem facing the country is to be centralized hereafter with the chairman of the board.

The control of industry and production about to be assumed by the board will involve the questions of national price fixing, international pooling of raw materials and the curtailment and possible elimination of less essentials, in all of which the board will have a directing hand.

The central directing agency in the new scheme is the Requirements Division of the War Industries Board and is headed by Alexander Legge. Upon this the War and Navy Departments, the Shipping Board and Food and Fuel and Railroad administrations each will have representatives.

The needs of all departments hereafter will be submitted to this division, which thus will be able to furnish Chairman Baruch with complete information to guide him in determining the general industrial policy of the country, the organization of production and the relocation of industries.

To take charge of each problem of supply a special commodity section has been created. Each section will have card indexed capacity of every manufacturing plant handling this particular commodity, and its orders. It thus will have at hand all the needed information regarding any desired article coming within its jurisdiction and will be able to make a systematic allocation, according to the relative urgency of the needs of the various departments. For example, should the War and the Navy Departments each want a supply of certain shapes of steel, they will lay their demands before the Requirements Division and their purchasing agencies be told just how much to buy and where to place their orders. Purchases of the Allies will follow the same plan.

At the meetings of the commodities section, at which allotment of materials or facilities to fill the requirements is made the representatives of the various supply departments of the Government who are members of the section will have full share.

If any member of a commodity section is dissatisfied with a decision he may, if he wishes, file a protest with the section head and also with the head of his division or department. Then if, for example, he belongs to one of the Government supply departments, his chief may appeal for reconsideration to the War Industries Board, whose decision will be final, subject only to modification by agreement among the chairman of the War Industries Board and the respective Secretaries of War and the Navy and the chairman of the Shipping Board, whichever may be the one interested in the subject.

In cases where it becomes necessary to control an industry in whole or in part by means of allotments, the appropriate section will determine the allotments of materials, commodities and facilities to the several departments of this Government and to its allies and also the extent to which manufacturers or others, whether serving the civilian population or engaged in the manufacture of war supplies, shall be supplied.

When a commodity section comes to make its full report on the allotment of any specific requirements the chief of that section will notify a member of the priorities division of the War Industries Board to be designated for such purpose by the priorities division, who will, with the section chief and the member, consider and tentatively determine the priority rating which such requirements will take when orders therefor will have been placed.

Such tentative rating will be observed by the priorities committee in connection with all applications for priority on orders covering such requirements unless the priorities committee should (because of conditions changing in the time intervening between the time of the fixing of the tentative rating and the application for priorities or other good cause) conclude such rating to be improper; in which event the section chief and each member of the section fixing the tentative rating will be so notified and have an opportunity to be heard before such rating be changed. In the event a change is made the section chief or any member may appeal from such decision in the manner prescribed by that portion of the organization plan of the War Industries Board governing priorities.

NAVAL *and* MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
AEF—On duty with the American Expeditionary Forces.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CCI—Report to Chanute Field, Champaign, Ill.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Door Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parantheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PRC—Appointment to Aviation Section declined; prefers retaining previous commission.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRV—Report to Richmond Aviation School, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Col. B. P. Disque, Spruce Division, Yeon Bldg., Portland, Ore.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1. Report to points named for temporary duty in the order given.

Note 2. Report to Atlanta, Ga.

Note 3. Report to district manager of equipment, Detroit, Mich.

Note 4. Report to district manager of inspection, 15 Park Row, New York City.

Note 5. To Washington, temporary duty; then Millington, Tenn.

Note 6. Report to director of training, Bedell Building, San Antonio, Tex.

Note 7. Report to departmental aeronautical officer, New York City.

Note 8. Report to Lieut. Edward Howe, 16 Victoria St., Toronto, Canada.

Note 9. Report to Radio School, Columbia University, New York City.

Note 10. Report to Camp Hancock, Ga.

Note 11. Report to War Prison Barracks No. 2 for duty as censor.

A

Abels, Walter Jerome	SLR; DIK
Adams, Alfred A.	SLR; FRF
Archer, Allen Thurmer	SLR; RSD
Atkinson, Harold Kenneth	SLR; RSD
Aldredge, Sawnie Robertson	SLR; KST
Allen, Morton P.	SLR; FRF
Armstrong, John Fisher	SLR; LHV
Amsden, Charles Avery	SLR; AEF
Ashley, Edward E., Jr.	CAP
Andrews, William V.	OSU
Allein, Henry C.	FLR; AEF
Auchard, Oliver Cecil	SLR; KST
Archer, Morris	CAP
Ash, Thomas, Jr.	FLR; AEF
Acheson, Alexander M.	PFO
Allen, Richard Courtney	SLR; CWT
Andrews, James Bell	SLR; CDT
Appleton, James L.	PFO
Anderson, Richard M.	DIK
Armstrong, William J.	FLR; AEF
Allen, Richard C.	DIK
Anderson, Clarence	DIK
Adams, William Arthur, Jr.	SLR
Allen, Charles Edward	SLR
Alton, Robert Leslie	SLR
Aaron, Samuel A.	SLR
Alder, George W.	SLR
Ames, Adelbert, Jr.	CAP
Adams, John W.	SLR
Albertson, Edwin R.	SLR
Allison, Arthur Jerome	SLR; PFO
Acheson, John Huyler	SLR; GLC
Armes, Henry Lyman	SLR; GLC
Ashfield, Harvey	SLR; GLC
Aloe, Myron	FRF
Abbott, Louis Hyer	SLR; KST
Adams, James Douglass	SLR; DIK
Anderson, Richard Meriwether	SLR; KST
Annan, Duncan C.	FRF
Adams, John W.	FRF
Allen, Albert D.	FRF
Armour, Philip D.	SLR
Aaron, Samuel A.	FRF

B

Bloom, Edward Leon	SLR; RSD
Brown, William D.	SLR; CDT
Brown, Egbert DeW.	FLR; CDT
Brown, Robert Houston	SLR; KST
Brown, Harry D.	SLR; FRF
Brown, Harry Baldwin	SLR; TMA
Burton, John F.	FRF
Brunt, Shermer Douglas	SLR; KST
Blanton, Walter Keith	SLR; HHN
Black, Orlando Bacon	SLR; KST
Bedell, Nelson Henry	SLR; HHN
Baxter, Howard Francis	SLR; KST
Boothe, Ross	SLR; HHN
Burr, Richard Olcott	SLR; RSD
Ballard, Homer Ditmar	SLR; EOT
Bell, George Edward	SLR; RSD
Barnard, George Augustus (2d)	SLR; EOT
Barnett, Arthur Rex	SLR; SBI
Berg, Henning Julius	SLR; EOT
Boles, Charles Frank	SLR; SBI
Baker, Robert Lynn	SLR; EOT
Breese, Robert Potter	SLR; HHN
Bolender, Fred John	SLR; TFT
Bacon, Vaughan Robert	SLR; LHV
Bamberger, Raymond S.	MAJ; FOB
Bishop, Miller V.	CAP
Burns, Charles Hugh	SLR; PMT
Brown, Austin Haymond	SLR; KST
Brown, Harry Dugan	SLR; GLC
Browne, Charles E.	PFO
Bown, Ralph	CAP
Burrucker, William C.	PFO
Behrendt, Eugene	CAP
Bahel, Frank	CAP
Bradley, Charles Clarence	SLR; KST
Black, Avery John	SLR; RSD
Burnham, Stanley	SLR; KST
Bradfield, William L.	FLR; AEE
Brazelton, William Lawson	SLR; KST
Bolton, John Hugh	SLR; RSD
Browning, $rving Knox	FLR; PFO
Bowen, Scott Howe	SLR; RSD
Birdseye, Garner Kippen	SLR; EOT
Buell, Llewellyn M.	OSU
Brock, H. Irving	CSO
Barrett, John Minott	SLR; KST
Bentley, Madison	CSO
Birnbaum, Bert J.	DIK
Bailey, Foster	SLR; KST
Blaney, Lewis	FLT
Buckley, Douglas A.	PFO
Badham, Henry L.	FLR; AEF
Bassett, Herbert B.	LHV
Beach, Merritt Stephen	SLR; RSD
Barr, George D.	FRF
Blood, Howard Earl	CAP

Baetjer, Charles H.	CAP
Bailey, Frederick W.	DIK
Branson, Harold W.	DIK
Brownlee, Fred P.	DIK
Burton, Joseph Whitner	SLR; KST
Brady, William T.	FRF
Black, Robert O.	FRF
Boland, Thomas	CAP
Benedict, Robert P.	FRF
Burns, Edward	CAP
Barnes, Paul V.	SLR
Baumberger, Charles A.	SLR
Bradford, Henry E.	SLR
Brainerd, Fred L.	SLR
Branson, Raymond L.	SLR
Bressman, Earl N.	SLR
Buchanan, James D.	SLR
Bughman, Henry C., Jr.	SLR
Burke, Francis X.	SLR
Burke, George F.	SLR
Baker, Alton T.	FLR
Bonnalie, Allen F.	FLR
Buffington, Floyd J.	FLR
Boyd, John P.	FRF
Bibb, John T., Jr.	SLR
Brennan, James D.	SLR
Brooks, John B.	SLR
Behr, Fred Arthur	SLR; PMT
Barrett, Clement James	SLR; PMT
Barnard, Leon William	SLR; CWT
Burrucker, William Charles	SLR; KST
Baker, William Lester	SLR; CAF
Buchanan, James P.	FRF
Branson, Harold Wood	SLR; CWT
Buckler, Douglas Arthur	SLR; KST
Burgher, Ballard Young	SLR; KST
Bowman, Robert H.	SLR; KST
Bonsal, Stephen, Jr.	FRF
Bowen, Claude M.	FRF
Braun, Bruce E.	FRF
Brown, Isaac G.	FRF
Brown, Warren Day	TMA
Browning, Russell I.	FRF
Bailey, Elmer S.	FRF
Banks, Frank	FRF
Barnard, George A., (2d)	FRF
Bimm, Harry L.	SLR
Baird, Harold C.	FRF
Bowles, Walter S.	FRF
Bennett, Horace R.	FRF
Billups, Val T.	FRF
Boley, Austin F.	SLR
Bucklin, William Norris, Jr.	SLR; ELA
Bradley, Lyman Cook	SLR; KST
Baskey, Earl F.	FRF
Baez, Raphael, Jr.	FRF
Boyd, Beveraly M.	FRF
Burke, Hubert J.	FRF
Benham, Reid F.	SLR
Bonnevalle, Richard W.	SLR
Bramhall, Maynard	SLR
Bruner, Donal L.	SLR
Butterfield, Harold H.	SLR
Butterworth, Benjamin T., Jr.	SLR
Brookhauser, Guy W.	TMA
Bancker, William D.	FRF
Brown, Robert J., Jr.	FRF
Buck, Edward H.	FRF
Bradley, Charles E.	FRF
Bailey, William Frederick	SLR; CWT
Birnbaum, Bert Jake	SLR; CWT
Blakely, George W.	FRF
Braun, Arnold W.	FRF
Bloon, Robert B.	KST
Bailey, John William, Jr.	FRF
Bradford, Thomas L., Jr.	FRF
Bratton, Howard, Jr.	FRF
Birkett, Howard	FRF
Buckley, Charles J.	FRF
Brant, Gerald C.	Note 6
Blum, Alexander	SLR; KST
Buhl, Lawrence D.	SLR; KST
Blanchard, Leslie D.	DIK
Bittinger, Howard P.	SLR
Burch, Mark H.	SLR

C

Caldwell, Jobin B.	DIK
Clifford, Paul L.	FRF
Compere, Harold	SLR; RSD
Clark, Marshall G.	DIK
Covington, Harry Stockel	SLR; KST

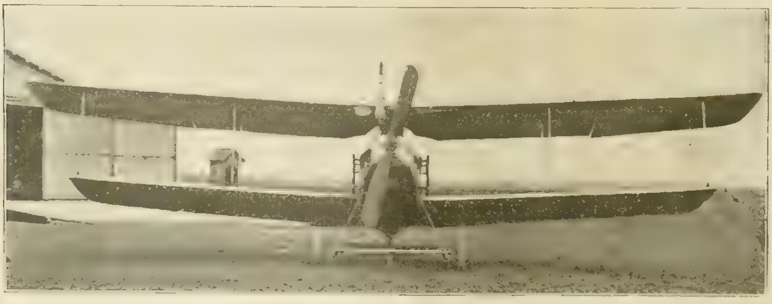
Lieut. Theodore Marburg, Jr., of the Royal Flying Corps, has succeeded Major Lord Robert Innes-Ker in charge of the recruiting station in New York.

Crary, Allan Hodgdon	SLR; KST
Clark, John Francis	SLR; KST
Callan, Paul J.	FLR; CDT
Cumming, David R.	FLR; CDT
Case, Ira Hamilton	SLR; TMA
Carley, Clyde Hicks	SLR; TMA
Cross, Albert	FLT; CMV
Carson, William Holmes	SLR; RSD
Coffing, Lawrence Dayton	SLR; RSD
Cox, John Dunlap	SLR; RSD
Cooper, Richard Dwyer	SLR; TFT
Crowell, Reginald B.	SLR; FRF
Crocker, George Augustus, Jr.	SLR; PMT
Cook, Howard Esdel	SLR; PMT
Clevette, Charles Francis	SLH; SBI
Cutts, George Belcher	SLR; DIK
Cudlipp, Jerome Moore	SLR; KST
Carron, William Evab, Jr.	FLR; EOT
Carver, Chauncey B.	CSO
Crum, Gay	SLR; KST
Coulter, William Adams	SLR; RWT
Coppinger, Connor	SGS
Christian, Carleton W.	FRF
Christian, Clarence H.	FRF
Cowgill, Russell Twaddle	SLR; EOT
Coffee, Rector C.	FLR; AEF
Carroon, William E.	FRF
Cousins, William S.	FLR; AEF
Culbertson, Craig	SLR; FOB
Case, Leland I.	FRF
Crisp, James Van D.	CAP
Clements, William T.	FLR; AEF
Callender, Leonard	FLR; PFO
Cotting, Charles E., Jr.	CAP
Carter, Charles F.	FRF
Coyle, Frank J.	DIK
Coulter, William A.	FRF
Cudlipp, Jerome M.	DIK
Coyle, Frank James	SLR; GLC
Colville, Clifford J.	FRF
Carlin, J. Francis	SLR
Charles, William K.	SLR
Charlton, Donald H.	SLR
Cole, Dausa W.	SLR
Collins, Raymond B.	SLR
Crissey, John C.	SLR
Calhoun, Abner W.	SLR
Callaghan, Robert L.	SLR
Carson, Robert H.	SLR
Clark, Wallace T.	SLR
Clarke, DeFranc	SLR

Cox, Leon C.	SLR
Craig, Alexander, Jr.	SLR
Cranford, Joseph O.	SLR
Cranford, Wilbur F.	SLR
Case, Walter E.	SLR
Coachman, James H.	SLR
Cobb, Edgar E.	FLR
Coleman, Richard R.	FLR
Craven, John D.	FLR
Cronin, Edward M.	FLR
Caldwell, Harold B.	SLR
Cameron, David	SLR
Carvin, Charles W.	SLR
Clark, Halford	SLR
Carusi, Joseph S.	SLR
Clark, Marshall Grant	SLR; LDT
Callender, Marshall C.	CAF
Curry, John F.	Note; 6
Castle, Otis H.	SLR
Chapin, Harry T.	SLR
Clanton, Bernie D.	SLR
Cole, Franklin B.	SLR
Comer, Braxton B.	SLR
Crist, Donald L.	SLR
Campbell, Elmer B.	SLR
Campbell, Horace L.	SLR
Carter, Paul B.	SLR
Cheak, Chester W.	SLR
Cooper, Walter W.	SLR
Cole, Charles C.	FRF
Christom, George L.	FRF
Changnon, Dale A.	FRF
Claghorn, James L.	FRF
Cook, Charles I.	FRF
Cannon, Lawrence H.	FRF
Cathcart, Sewall C.	FRF
Crosthwaite, Robert O.	FRF
Caldwell, Jabin Bush	SLR; CWT
Carrick, Spence Summers	SLR; KST
Carroll, Howard H.	SLR; KST
Cleveland, Bruce	SLR; KST
Colt, Russell Griswold	SLR; KST
Campbell, Marston, Jr.	SLR; VBW
Crissey, Sherman Barthollomeou	SLR; CWT
Cruickshank, Colin J.	FRF
Cone, Clarence N.	FRF
Collins, Paul F.	FRF
Conant, Rellis G.	FRF
Chapin, Charles G.	FRF
Churchill, Henry S.	CAF
Cowgill, Russell T.	FRF
Cormack, Joseph Marshall	SLR; CWT
Chilson, Roy W.	SLR; KST
Clancy, Edwin Menefee	SLR; KST
Clark, Ezra Westcote	SLR; KST
Cowell, Charles Lewis	SLR; FLA
Colton, Arthur W.	SLR; KST
Cooper, Robert Berry	SLR; CWT
Connell, Samuel M.	FRF
Cheney, Archibald F.	KST
Curtiss, Frederick W., Jr.	FRF
Cary, Edward A.	FRF
Crane, Oliver P. H.	FRF

D

Davidson, Oscar Dean	SLR; EOT
Dey, Donald Mitchell	SLR; KST
Dugger, Eugena Frank	SLR; CWT
Davis, Samuel H.	SLR; FRF
Degon, Elmer Fred	SLR; TFT
Doherty, John Paul	SLR; WFO
Dewey, Maurice John	SLR; EOT
Dickinson, Charles E., Jr.	FRF
Deming, Guy S.	CAP
Dobie, Richard Lee	SLR; KST
de Fremery, Leon	SLR; EOT
Devereaux, Walter B., Jr.	CAP
Delhomme, George Arthur	FLT
Dodds, Hiram Elbert	SLR; RSD
Dudley, Albertus D.	REL; CSO
Dickson, Charles M.	PMT
DeHoog, Raymond Edgar	SLR; CDT
Doherty, James F.	CAP
Dean, Alexander R.	FRF
Dawson, Thomas L.	FLR; AEF
Daves, Oliver R.	FLR; AEF
Dwight, Henry W.	FRF
Dade, Alexander L., Jr.	FLT
Douglas, D. Dwight	CAP
Dole, Arthur, Jr.	DIK
Davey, James J.	DIK
Desson, Leonard J.	FLR
Dillin, Forrest H.	SLR
Dee, Lawrence T.	SLR
DeFrates, LeRoy C.	SLR
Drennan, Walter H.	SLR
Dyer, Edwin L.	SLR
Dilworth, Dewees Wood	SLR; KST
Driscoll, Edgar Joseph	SLR; KST
Dice, Agnew Thomson, Jr	SLR; WCS; Note 4
Drury, Newton Bishop	SLR; FOB
Delana, Edward K.	FRF
Davis, John E.	FRF
Decker, Kenneth	CAF
Davis, Roy Le Fevre	SLR; KST
Davey, James Joseph	SLR; CWT
Doolittle, James Harold	SLR; RSD
Dahman, Wallace W.	SLR
Dean, John R.	SLR
DeCourcy, William E.	SLR
Duke, Leslie	SLR
Donalds, John E.	FRF
Dounce, Clifford B.	SLR
Dwiggins, Russell H.	FRF
Durkee, Hugh B.	SLR
Davies, John P.	FRF
Drury, Alden M.	FRF
Dudley, John E.	FRF



A Two-seater German Rumpler Battleplane

Dougherty, Francis M	FRF
deFremery, Leon	FRF
Davis, Louis E	FRF
Dunlap, John R	FRF

E

Enright, Walter J	FRF
Edwards, Carl William	SLR; RSD
Eliot, Samuel	SLR; WFO
Enright, John E	CAP
Etheridge, Asa J	CAP
Easley, Sam A	PFO
Englehart, George	FLT
Edler, Raymond C	DIK
Enders, Gordon B	FLR
Eaton, Irving	SLR
Eaton, Leland W	SLR
Eckel, Jacob E	SLR
Eddins, Rufus R	SLR
Edgerton, George W	SLR
Ensign, Ralph H	SLR
Ewing, James C	SLR
Edler, Raymond Charles	SLR; LDT
Edgerton, James C	FRF
Epp, Otto C	FRF
Epperson, Arthur R	FRF
Eggleston, Herbert C	TMA
Ellis, Arthur R	TMA
Ernst, Norman C	FRF
Emory, George N	FRF
Easley, Sam A	FRF
Everett, Charles	Note; 11

F

Farr, Newton C	SGS
Frost, John J	DIK
French, Donald Eakin	SLR; GLC
Frink, Henry Post	SLR; WFO
Forbes, Howell	SLR; FRF
Fleet, Rutherford	HLR; KST
Foster, Henry B., Jr	FLR; CDT
Frazee, Harold David	SLR; GLC
Fields, Curtis Philip	SLR; LDT
Fuller, Willard Perrin	CAP
Fanthom, Murray C	FRF
Freas, Walter Johnson	SLR; KST
Froelich, Hugo Ferdinand	SLR; FOB
Fishel, Harry O	FLR; AEF
Friesen, Ernest Clare	SLR; RSD
Frost, John William	SLR; LDT
Fagg, Fred Dow, Jr	SLR; RSD
Ford, Bernard Waterloo	SLR; KST
Fleet, Reuben H	CAP
Frost, Edward P	FRF
Farnsworth, Augustus D	FRF
Fish, George F	FRF
Foy, William J	FLR
French, Harold S	FLR
Feuchtwanger, Paul J	SLR
Flaherty, Morgan James	SLR
Franklin, John A	FRF
Fraser, Kenneth Gatiss	SLR; DIK
Farish, Stephen Power	SLR; KST
Fuller, Clifford Justis	SLR; KST
Felts, Jess A	SLR
Fisher, Albert L	SLR
Fitch, James C	SLR
Fitzgerald, Edmund, Jr	SLR; KST
Flannery, William Blackman	SLR; KST
Franzheim, Henderson K	FRF

G

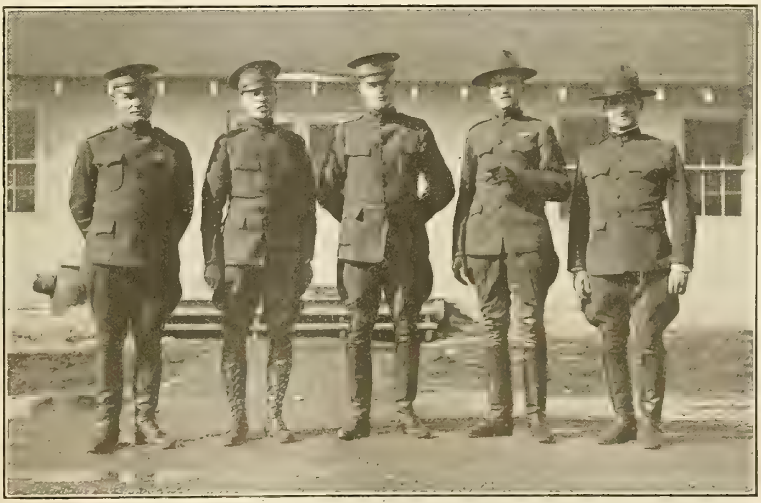
Gordon, Charles	SLR; GLC
Green, Robert Corbould	SLR; GLC
Griffin, Roscoe Charles	SLR; GLC
Gulick, Edward Leeds, Jr	SLR; PMT
Gray, Ralph C	SLR; RSD
Golonsbe, George Jonathan	SLR; RSD
Goodale, Frank W	FOB
Gould, Edgar Russell	SLR; WFO
Griffin, Norval Burris	SLR; WFO
Gallinger, Nathan Kraus	SLR; KST
Gastreich, Joseph W	FLR; CDT
Grimes, David	SLR; KST (2)
Greening, Wendell G	FLR; AEF
Guest, David P	FRF
George, Rob Roy	SLR; TFT
Gibson, James Raymond	SLR; KST
Graham, LeMoyne Reginald	SLR; TFT
Gardiner, Edwin Irene	SLR; KST
Garnier, Edward Wynn	SLR; PMT
Glidden, Charles J	CAP
Grimm, Paul	SLR; BST
Gilmore, Donald Henry	SLR; RSD
Grogg, Russell Isaac	SLR; PMT
Griffith, Fred C	PFO
Gillis, Roger	SLR; ELA
Goos, Carl N	FRF
Graham, Leland J	FRF
Graiezunas, Vytautas A	PFO
Greene, William W	TMA
Gonyo, Clarence F	CAP
Gifford, Lawrence W	FLR; AEF
Garland, Arthur H	SLR
Garner, Jack A	SLR
Gilmore, Otis L	SLR
Green, Harold I	SLR
Guthrie, Harry C	SLR
Gwyer, Kingsley V	SLR
Gregg, David	FLR
Griffith, Robert J	FLR
Gardner, Roy B	SLR
Glenn, Charles E	SLR
Grover, John Hill	SLR
Granville, Bernard R	Note; 5; PMT
Gatch, Nelson B	Note; 7; WCS
Grace, Morgan H	Note; 4
Griffin, William Louis	SLR; HHN
Gally, Thomas Kilburne	SLR; KST

Major W. P. Pearson is commander of the School of Military Aeronautics at the University of Illinois.

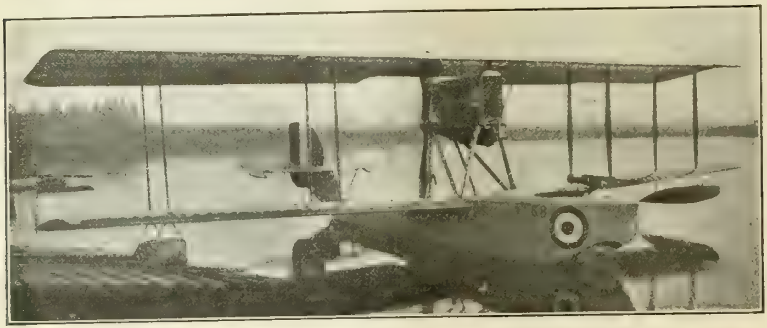
Gifford, Joseph Barney	SLR; KST
Gore, Thomas Edwin	SLR; KST
Ganey, Daniel F., Jr	SLR
Gibson, Edward B., Jr	SLR
Greenwood, Samuel A., Jr	SLR
Griffith, Clyde I	SLR
Gross, Edward H	SLR
Grummey, James M	CAF
Gans, John Edgar	SLR; KST
Gilchrist, Claude F	FRF
Gowan, George	FLR; KST
Geisendorf, Louis C	FRF
Graicunas, Vytautas A	FRF
Gale, Harold D	FRF
Gelwicks, Myles W	FRF
Grantz, Raymond L	FRF
Geisse, John H	FRF
Gilman, Arthur R	FRF

H

Harris, Joel G	FRF
Highley, Thomas Hiatt	SLR; KST
Hawke, Clarence Ewart	SLR; WFO
Hamilton, Mark Armistead	SLR; KST
Hendrickson, Charles John	SLR; WFO
Hightower, Charles Daniel	SLR; KST
Harding, Noah	FLR; CDT
Harvey, George Washington	FLR; CSO
Hill, Glenn R	FLR; CDT
Hart, Carl Hugh	FLR; VBW
Horter, Edward M	FLR; CDT
Hoffman, Albert J	LDT
Haack, Theodore Theophil	SLR; TMA
Holt, Robert Harold	SLR; ELA
Hillman, Alfred Daniel	SLR; KST
Hudgins, William Harkinson	SLR; LHV
Harris, William Larue	SLR; DIK
Harrell, Samuel Cheatham	SLR; EOT
Higgins, Curt Elwood	SLR; PMT
Hamilton, Clyde Marion	SLR; HHN
Himebaugh, Gero Albert	SLR; RWT
Malligan, Henry Martin Joseph	SLR; BST
Hamlen, Robert Cushing	CSO
Hogan, Clark Harvey	SLR; HHN
Howard, James G. L	SLR; FRF
Huston, Aubrey	SLR; LHV
Hilliard, Landon	SLR; CWT
Harwood, Archibald Roane	SLR; BST
Heqembourg, Theodore Marsh	SLR; EOT
Hays, Frank Kerr	SLR; KST
Haskins, Charles Herbert	SLR; KST
Ham, David Harvey	SLR; FOB
Huser, Thomas Everett	SLR; LHV
Haller, Hubert George	SLR; TFT
Hoare, John L	FRF
Harding, Paul Curtis	SLR; FOB
Hadley, Hamilton	CAP
Harriman, Walter F	DIK
Hughes, Francis F	DIK
Houghteling, William	CAP
Hostetter, Wilbur Dawson	SLR; GLC
Hitchcock, Thomas	MAJ
Hyman, Joseph H	CAP
Holmes, Wayne M	CSO
Himebaugh, Gero A	FRF
Hitchcock, Reuben	MAJ
House, William Russell	SLR; RSD
Hughes, Francis Forrest	SLR; KST
Horrell, Camden Riley	SLR; RSD
Hensley, James Willard	SLR; FOB
Hall, Levi Marion	SLR; CDT
Hanks, Stedman S	FRF
Host, Thomas Parker	SLR; RWT
Howard, James G. L	SLR; GLC
Heron, Percy Hotspur	SLR; KSR
Harbeck, Edward V	SLR; FRF
Hardin, Ray Stephen	SLR; PMT
Hogan, William A	FRF
Hostetter, Wilbur D	DIK
Holt, Henry E	CAP
Hooper, Edwin Majjox	SLR; FOB
Hoffman, Charles B	FRF
Harvey, Frederick H	CAP
Heath, Hamlin Russell	SLR; KST
Host, Thomas P	FRF
Helms, Leslie R	FRF
Harmon, Frank H	DIK
Hopkins, Rees	SLR
Harkins, Harry H	FLR
Heater, Charles L	FLR
Heinsohn, Augreau G	FLR
Holden, Kenneth H	FLR
Horton, Frederick W	FLR
Hudson, Henry B	FLR
Harris, Charles L	SLR
Hart, Marion F	SLR
Henzy, Urban L	SLR
Herlihy, Harold W	SLR
Hoffman, Jacob V	SLR
Hogen, Frank G., Jr	SLR
Hosmer, Fred E	SLR
Hollaman, Frederick T	SLR
Hook, Sidney B	SLR
Harris, Joel G	DIK
Harmon, Frank Harry	SLR; KST
Hager, Daniel I	SLR
Hardy, Richard L	SLR
Henry, William L	FRF
Hill, Armistead B	FRF
Hequembourg, Theodore M	FRF
Hopkins, Lionel P	FRF



Group of aviation officers. Left to right: Lieut. R. E. Fields, commander of the 38th Squadron, Lieut. E. W. Lewis, supply officer, Chanute Field; Lieut. Dodds, Lieut. H. M. Smith, and Lieut. Harry Winner, commander of the 203rd Squadron.



The Savoia 168 H. P. Reconnaissance Flying Boat. (Italian Official Photo.)

Hartline, William R	FRF
Horne, George W	FRF
Hayden, Thomas Heller	SLR; DIK
Henderson, Justin	SLR; KST
Hosman, Everett Mills	SLR; KST
Hugus, Z. Zimmerman	SLR; KST
Hansen, Harry L	FRF
Hollingsworth, Frank E	SLR; FRF
Harwell, Gordon L	FRF
Hicks, Leo R.	SLR; HHN
Harrison, George A	SLR
Harrell, Samuel C	SLR

I

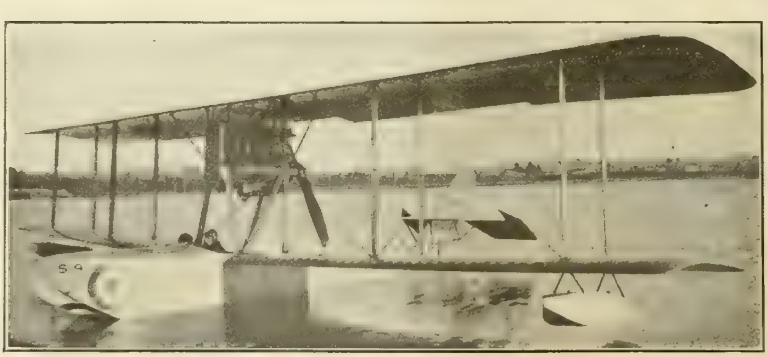
Inglesby, Joseph Edmund	FLR; CDT
Ingle, Joseph Lombard	SLR; RSD
Isham, Howard Fuller	SLR; JRC
Ison, Nathaniel B	FRF

J

Johnson, Gordon E	DIK
Johnson, Charles Cousins, Jr	SLR; KST
Johnson, Howard Henry	SLR; LHV
Johnston, Edward McKeehan	SLR; KST
Johnstone, Edwyn	FLR; AEF
Jeffries, John M	SLR; FRF
Jeffries, Simeon Jackson, Jr	SLR; RSD
Jackson, Norris Dean	SLR; KST
Jaenke, William D	FRF
Jones, Montgomery Osborne	SLR; CWT
Jones, Fred Lemuel	SLR; RSD
Jones, Lee Bryan	SLR; FOB
Jones, George W	CAP
Jones, E Lester	LTC
Jackson, Joseph W	FRF
Jacobson, Chester J	DIK
Judge, Joseph Bermingham	SLR; RSD
Jenks, Frederick Angier	SLR; LHV
Jelly, James J	DIK
Jolly, James Stuart	SLR; GLC
Jefferson, Theodore	FRF
Jackson, Joseph W	FRF
Jaenkle, William D	DIK
Jepson, Walter C	FLR
Jackson, Byron, Jr	SLR
Jackson, Perry B	FLR
Johnson, Harold McC	SLR
Junk, Fred H	SLR
Johnson, Rollin George	SLR; KST (2)
Johnson, Elmo G	FRF
Jacob, William C	FRF
Johnson, Gordon Earl	SLR; CWT
Jones, Christopher L	FRF
Jones, Russell G	FRF
Jones, Edward D	FRF
Jenkins, Burris A., Jr	FRF
Jack, Butler, Jr	SLR
Jacobi, George N., Jr	SLR
Johnston, John W	SLR

K

Kanitz, Edwin C	FRF
Koontz, John N	FLR; AEF
Koontz, Leonidas Lee	SLR; KST
Kelly, Frank Vincent	SLR; LHV
Kelly, Edward Rudolph	SLR; RSD
Kindred, Herbert LaFayette	SLR; KST
Kemp, Louis Wiltz	SLR; PMT
Kite, Warren Powers	SLR; KST
Knight, Arthur Draper	SLR; TFT
Kirkpatrick, Oran Gould	SLR; KST
King, Gelston Tyler	SLR; EOT
Kilburn, Harold E	PRC
Kilburn, James B	CSO
Kaplowitt, Mack Byron	SLR; KST
Kellegrew, Edward Wells	SLR; ELA
Kruss, Edmund Andreas	FLR; RSD
Knapp, Robert Duane	SLR; RWT
Kunkel, Erick James	SLR; LHV
Kirkby, George Phillip	SLR; KST
Kear, Charles E	FLR; CDT
Kennedy, Donald B	FRF
Kincade, Franklin P	MIT
Kirkpatrick, Stewart Ray	SLR; FOB
Keller, Frederick William	SLR; RSD
Kingsland, George Dudley	SLR; FOB
Kimball, Dan Able	SLR; RSD
Keys, John F	SLR; CDT
Kreis, Stanley Arthur	SLR; KST
Kober, Edward Irving	FLR; CDT
Kelly, Fred W	DIK
Kittell, Mellan F	FRF
Kennedy, David S.	FRF
King, Ivan R	PMT
Kerr, George Reed	SLR; LHV
Kelly, Robert A	FLR; AEF
Krause, James W	FLR
Knudsen, Herluf A	MIT
Kelly, Fred Warren	SLR; GLC
Kinney, Morris	FRF
Kelly, Martin P	FLR; AEF
Kennedy, Frank E	FRF
Kiler, John O	DIK
Keeney, Charles C	SLR
Kelso, Fred O	SLR
Kent, Warren T	FLR
Kincaid, James B	FLR
Knowles, Maurice N	FLR
Keys, Arthur A	DIK
King, Paul A	DIK
Kendall, Edward Hale	SLR; TFT
Kalmbach, William Benjamin	CAP
Kanitz, Edwin C	DIK
Kirkpatrick, Richard J.,	FLR; TFT; CAF; Note 1
Kunkel, Frederick Eugene	SLR; KST
King, Paul Arthur	SLR; CWT
Kelleher, Melvin B	FRF
Kugler, Martin B	FRF
Kelly, Sherwin F	FRF
Kenney, Parker J	TMA
Kroll, Harry David	SLR; KST
Knight, James K	FRF
Kesler, Leland W	SLR
Kahl, Charles A	SLR



The Italian "Savoia" 300 H. P. Bombardment Flying Boat. (Italian Official Photo.)

Kingsley, Charles	SLR
King, Gelston T	FRF

L

Lawson, Oliver Morrison	SLR; FRF; GLC
Larsen, Chauncey M	FRF
Luce, Raymond Philip	SLR; RSD
Lloyd, Lawrence Albion	SLR; CWT
Lycan, William J. B	SLR; KST
Lathrop, Fred Burr	SLR; TFT
Lenihan, William Stanislaus	SLR; TFT
Lindsey, Harold	SLR; DIK
Lange, Richard	FRF
Lee, Bernard Wyman	SLR; HHN
Ludwig, Nicholas Henry	SLR; TFT
Lund, William J	SLR; WFO
Lowry, Swift Miller	SLR; KST
Loening, Albert Palmer	CAP
Lowry, Hal Marmaduke	SLR; KST
Lawrence, Dudley B	REL; UIU
Langston, James Argile	CAP
Linder, John E	FRF
Liles, James Franklin	FLR; AEF
Linkenauger, Ernest	SGS
Larned, John Hawley	CAP
Lawyer, Samuel Edward	SLR; GLC
Littlefield, Henry M	SLR; LDT
Lewis, Halstead H	DIK
Lomax, Thornton Garland, Jr	SLR; KST
Lucas, Philip Dearborn	SLR; KST
Lownsbery, Gay T	DIK
Lasell, John W	FRF
Lobdell, Jacob Karl	SLR; RSD
Long, Leonard F	SLR; PFO
Lautz, Theodore V. V	DIK
Lawyer, Samuel E	DIK
Lazar, Eugene	MAJ
Lewis, Leroy D	CAP
Langley, John A	FRF
Landes, Henry B	SLR
Liebes, Arnold L	SLR
Lodewyck, Arthur G	SLR
Lundeen, Arthur	SLR
Logan, Henry Patrick	SLR; KST
Larcomb, Richard C	FLR
LeRoy, Clair H	FLR
Lewis, Arthur L	FLR
Leyson, Burr W., Jr	FLR
Loomis, Henry S	FLR
Little, Frederick E	SLR
Lehr, Robert Phillip	SLR; FOB
Lundquist, Harry Melvin	SLR; RSD
Lewis, Halstead Harden	SLR; KST
Lassiter, Glenn Robert	SLR; FOB
Lewis, Thomas J	CSO
Lewis, Chauncey Glenn	SLR; KST
Lownsbery, Guy Templeton	SLR; KST
Leffler, Claude William Skilling	SLR; CWT
Long, Leonard Franklin	SLR; KST (2)
Loud, Harold E	FRF
Lee, John C	SLR
Leek, John B	SLR
Lesher, Carl R	SLR
Lyon, Alfred J	FRF
Liebhauser, Edgar A	FRF
Littlefield, Henry M	DIK
LaBoiteaux, Andrew J	FRF
Lenox, William J., Jr	FRF
Long, Carl C	FRF
Law, Hugo B	FRF
Lee, Zanna P	FRF

M

McMichael, John H	FRF
McGinley, John Joseph	SLR; HHN
McHenry, Arthur James	SLR; RSD
MacLaughlin, Thomas Greennwood	SLR; FOB
Massey, Raymond Rufus	SLR; CWT
Murpny, Edward Joseph	SLR; KST
McLellan, Hiram John	SLR; LDT
McKoy, Francis K	DIK
Mulvihill, Mead J	FRF; DIK
Murray, Charles W	FRF
Merrick, Louis M	FRF
Magee, David W.	PFO
McHenry, Arthur J	PFO
Meyer, Adolph Henry	SLR; SMM
Mason, Ernest John	SLR; EOT
Morris, Wistar	FLR; AEF
Mills, John K	REV; CSO
McCormick, Francis Howard	SLR; PMT
Moore, William Etstell	SLR; GLC
Meehan, Timothy E	FRF
Maranville, Clarence H	MAJ
Mackall, Porter A	CAP
McMath, Robert R	CAP
Miller, Leo J	DIK
Martin, David M	FRF
Metcalf, Arthur Boyd	SLR; KST
McCall, Carlton Cook	SLR; LDT
Moisant, Stanlie John	SLR; RSD
McArthur, Emmett King	SLR; FOB
Martin, Howard Charles	SLR; RSD
Matthews, William	FLR; AEF
McPeak, Normal B	PFO
Morison, James C	PFO
Moulthrop, John Robert	MAJ
Mahler, Herbert P	DIK
Morrissey, Raymond A	DIK
Morey, John Davis	CAP
Mitchell, Raymond Ashton	SLR; RSD
Magee, David Willis	SLR; RSD
Manning, James F., Jr	FLR; AEF
Moses, Lester E	SLR; PFO
Montagne, Alfred August	SLR; RSD
Mahool, James S	CAP
Mann, Merrill D., Jr	FRF

MacDonald, James E.	DIK
McLellan, Hiram J.	DIK
Moore, William E.	DIK
Marshall, Willis M.	DIK
McCoy, John Wesley	SLR; AAD
McGraw, John Edward	SLR; RSD
McParland, Norman Dillon	SLR; HHN
McDonnell, Edwin Alexander	SLR; KST
McClure, Colin Barr	SLR; GLC; FRF
McWhorter, Ray Seely	SLR; KST
McCormick, John Brokaw	SLR; RSD
McDoneul, Edwin A.	SLR; FRF
McPeak, Norman Bernard	SLR; CWT
McCurdy, John Anderson	SLR; KST
Macaulay, Theodore C.	FRF
MacMichael, John Henry, Jr	SLR; RWT
MacDonald, Neil Charles	SLR; BST
Murray, John Joseph	SLR; TFT
Menefee, Jesse Irving	SLR; KST
Moore, Charles F.	FLR; AEF
Merrill, Leland Hawthorne	SLR; LHV
Martin, Charles Jay	SLR; KST
Meyer, Charles Frederick	SLR; KST
Malmgren, Carl Ephraim	SLR; DIX
Mixter, Samuel	OSU
Misfeldt, George William	SLR; KST
Mullineaux, Lester Ray	SLR; CWT
Munroe, James Stewart	SLR; KST (2)
Murphy, John Patrick	SLR; KST (2)
Maurer, William Ritschy	SLR; KST
Morgan, William Victor	SLR; RSD
Monteith, Charles Norton	SLR; KST
Mahnken, Walter Rudolph	SLR; TFT
Matthews, George Berrien	SLR; PMT
Miller, Walter B.	SLR; AEF
Mahler, Herbert Philip	SLR; FRF
Mellor, Lloyd Eldon	SLR; KST
Mahler, Herbert Philip	SLR; GLC
Morris, William Cobb	SLR; RSD
Michels, Joseph Stephen	SLR; DIK
Miller, Henry J. F.	LHV
Mohrman, Louis Grupe	SLR; RWT
Meany, John W.	FRF
Moore, Herve C.	SLR; DIK
Metcalf, Harry H.	FRF
Moon, Charles Morris	SLR; KST
Markham, Robert Benjamin	SLR; KST
Mack, Walter R.	SLR
Mentzer, John W.	SLR
Mitchell, George W.	SLR
Mansfield, John Clark	SLR; TFT
Morrison, Walter F.	SLR
Maloney, Charles P.	FLR
MacWhirter, Donald	SLR
Mann, Alfred C.	SLR
Moody, Corbitt L.	SLR
McCook, Forrest T.	FLR
Mulle, Harold D.	FLR
Montgomery, James Evans	SLR; DIK
McCormack, Victor A.	SLR; BST
Merrill, Keith Bartlett	SLR; KST
Marsh, Albert Ernest	SLR; KST
Markel, Charles H.	FRF
Murphy, Gerald Clery	SLR; CGC
Meinzer, Fred Henry	SLR; KST
MacDonald, James Eugene	SLR; LDT
McFeely, Joseph	SLR; KST
Mason, Ernest J.	FRF
McKenzie, Robert Roderick	SLR; KST
Mann, Walter Louis	SLR; KST
Mayer, Walter Jacob	SLR; KST
Moore, Herve C.	SLR; CAF
Miller, George A.	FRF
Morgan, Paul Victor	SLR; KST
Mann, Merrill D.	SLR; FRF
Mahler, Herbert F.	SLR; CAF
Meyers, Harold	SLR; FRF
MacFadden, Willford, Jr	FRF
Melick, Paul K.	FRF
Morris, Roy K.	FRF
MacKenzie, Clyde C.	FRF
McGovern, John E.	SLR
Morgan, Stuart A.	SLR
Morris, Edward S.	SLR
Munson, Clinton G.	SLR
Mayer, Henry	SLR
McKnight, James A.	FRF
Mulvihill, William H.	FRF
Massey, Raymond R.	DIK
Maynz, Theodore	FRF
Myers, Franklin D.	FRF
McDuffee, William S.	FRF
Miller, Roy G.	FRF

N

Nimocks, Robert G.	FRF
Nelson, Thomas Edward	SLR; TFT
Nelson, Fred Cyrus	SLR; KST
Newbold, Edwin E.	CAF
Nolan, Edward James	SLR; KST (2)
Neely, Harold R.	FRF
Nelson, Theodore	SLR; FOB
Nolker, Herman William	SLR; FOB
Norton, Paul Thornley	SLR; DIK
Newman, Robert Edmund	SLR; AAD
Nicol, Carlisle F.	FLR; AEF
Nimocks, Robert G.	DIK
Nichols, Luther A.	DIK
Newman, Carl Emory	SLR
Nevius, Ruliff	FLR
Nance, John T.	DIS
Nicholson, Knox Willard	SLR; PFO
Norris, Byron Bacon	SLR; KST (2)
Nordeen, Ansel G.	FRF
Nugent, Leo J.	FRF
Neal, Paul M.	FRF
Nowlen, Stanley	FRF
Norton, Henry Kittredge	SLR; KST
Nugent, Daniel Casey, Jr	SLR; KST
Nutt, Clifford C.	FRF
Niles, Edward A.	FRF
Neely, Forest H.	FRF
Nelson, Sinius J.	FRF
Nelb, Alfred W.	SLR
Nichols, Brayton	FRF

O

O'Meara, Cornelius Smyth	SLR; KST
O'Neil, James Huson	SLR; SMM
O'Brien, Raymond Henry	SLR; KST (2)
O'Reilly, Paul Leo	SLR; RSD
O'Flaherty, Daniel Vincent	SLR; KST (2)
O'Brien, Maurice Francis	SLR; EOT
Olds, Edward Clarence	SLR; KST (2)
Ott, Lambert, Jr	SLR; KST (2)
Osborne, Henry Plant	SLR; KST (2)
Olsen, Eugene Field	SLR; KST
Olsen, Clarence A.	FRF
Olson, Horace Edsall	SLR; GLC; FRF
Ordway, William Floyd	SLR; RSD
Onatavia, Thomas L.	FLR; AEF
Osborne, Charles L.	FLR; AEF
O'Melveney, Stuart	SLR; ELA
Oliver, Robert S.	FRF
O'Connor, William J.	LHV
Olin, Robert N.	SLR
Orlob, Rudolph	SLR
Orr, Harry B.	SLR
O'Brien, Robert E.	Note 2; WCS
Olson, Charles Willard, Jr	SLR; KST
Olsen, Horace E.	CAF
O'Brien, Matthew H.	FRF
O'Brien, Maurice F.	FRF
O'Neil, James J.	FRF
Overholt, George T.	FRF
Owen, Maurice C.	SLR

P

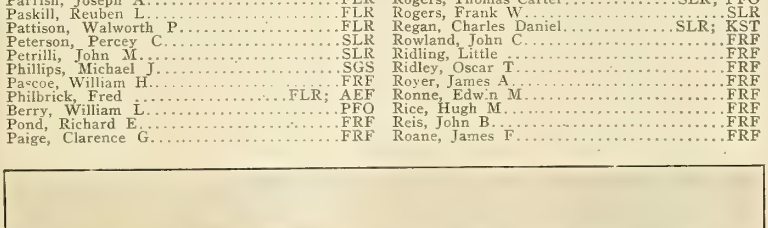
Polk, George Washington, Jr	SLR; KST
Pike, Vernon Bender	SLR; KST (2)
Peters, Sydney Van Wyck	SLR; RSD
Petree, Leo Webb	SLR; KST
Pendleton, James Dudley	SLR; KST
Parrish, John E.	SGS
Palmer, Ralph Warren	SLR; KST (2)
Pratt, George White	SLR; CSO
Presley, Curtis E.	SLR; DIK
Parker, Ashton	SLR; KST (2)
Powell, Edward M.	SLR; DIK
Price, Stuart E.	SLR; KST
Perry, William Leslie	SLR; RSD
Pardy, George William	SLR; DIK
Pursley, Charles Addison	FLR; CDT
Pearson, James Arthur, Jr	SLR; LHV
Powell, George	CAP
Peabody, Howard Bell	SLR; RSD
Poillon, Richard	CAP
Parkhurst, Amos James, Jr	SLR; FOB
Philbrook, Philip Edwin	SLR; FOB
Pratt, Clifford Vincent	SLR; FOB
Prem, Frank Herbert	SLR; KEST (2)
Post, Speed L.	DIK
Pynn, Leander Giles	SLR; SMM
Pettus, William B.	CAP
Powell, Howard H.	CAP
Purdy, George William	SLR; DIK
Philbrook, Jacob Brayton	SLR; RSD
Penberthy, Paul	SLR; RSD
Paden, Robert W.	SLR
Peik, Paul G.	SLR
Perry, Merrill G.	SLR
Peterson, John A.	SLR
Powell, Garland W.	CAP
Pooler, Joseph E.	SGS
Parrish, Joseph A.	FLR
Paskill, Reuben L.	FLR
Pattison, Walworth P.	FLR
Peterson, Percey C.	SLR
Petrilli, John M.	SLR
Phillips, Michael J.	SGS
Pascoe, William H.	FRF
Philbrick, Fred	FLR; AEF
Berry, William L.	PFO
Pond, Richard E.	FRF
Paige, Clarence G.	FRF
Page, Frank A.	FRF
Presley, Curtis E.	FRF
Parker, Robert MacDonald	SLR; RSD
Parker, Albert Nelson	SLR; LDT
Parker, Roy C.	FRF
Parsons, Jay H.	FRF
Power, Hugh C.	SLR; FRF
Purcell, William L.	SLR; FRF
Phillips, Robert F.	SLR
Pendleton, Talbot T.	FRF
Phelps, Richardson	SLR; KST
Parmer, Oscar S.	SLR; FRF
Painter, Parker	FRF
Peterson, Tenny C.	FRF
Page, David G.	Note 3; WCS
Palmer, Paul E.	Note 10; FLR
Pierce, Hugh Marion	CAP
Peterson, Harold G.	FRF
Peck, Lott M.	SLR

Q

Quina, Marion A., Jr	FLR

R

Richardson, Elbert L.	LHV
Richardson, Ross Theron	SLR; SMM
Rogers, Emery H.	SLR; DIK
Ruid, Guy Kendrix	SLR; KST
Reynolds, Watkins Wendell	SLR; TFT
Rafeld, Max Louis	SLR; LHV
Rolston, Brown	SLR; KST
Randall, John F.	FLR; AEF
Royall, John Edwin, Jr	SLR; KST
Rorick, Estell H.	SLR; DIK
Russ, Leon Fair	SLR; KST
Royle, William H.	FLR; AEF
Rivers, Walter Ben	SLR; RWT
Ray, Wilmer	SLR; KST (2)
Rudolph, Jacob H.	CAF
Reddy, Philip Jerome	SLR; SBI
Ridgeway, Erwin Tatum	SLR; KST
Rowe, Ralph S.	FRF
Roberts, Carroll Harry	SLR; EOT
Richmond, Arthur L.	CAP
Reed, Harvey Swartley	SLR; LDT
Reid, Charles A.	CAP
Russell, Laurence L.	SLR; FRF; RWT
Rogers, Franklin Lewis	SLR; LDT
Roadhouse, Wilbur	SLR; DIK
Royce, Walker Wirt	SLR; RSD
Roberts, Roscoe Owen	SLR; EOT
Rothfeld, Lawrence	SLR; AAD
Rinehart, John B. G.	SLR
Robinson, Bernard B.	SLR
Rockstroh, Frederick C.	SLR
Rowe, John A.	SLR
Riley, Sidney A., Jr	SLR
Robinson, Malcolm G.	SLR
Rogers, Lee H.	SLR
Rogeri, Newton C.	FLR
Ryan, Martin A.	FLR
Roth, Archie Frederick	SLR; GLC
Ranklin, John W.	SLR
Reiss, George S.	PFO
Ristig, William B.	FRF
Roth, Archie F.	DIK
Reardon, Oliver A.	FRF
Robinson, Charles McKinley	SLR; DIK
Robinson, Clark	SLR; FRF
Richardson, Durston G.	SLR; CAF
Roberts, Roscoe O.	FRF
Roberts, John W.	SLR
Roberts, Carroll H.	FRF
Rothenberg, Elmer E.	SLR
Rogers, Thomas Carter	SLR; PFO
Rogers, Frank W.	SLR
Regan, Charles Daniel	SLR; KST
Rowland, John C.	FRF
Ridling, Little	FRF
Ridley, Oscar T.	FRF
Royer, James A.	FRF
Ronne, Edwin M.	FRF
Rice, Hugh M.	FRF
Reis, John B.	FRF
Roane, James F.	FRF



The Berckmans Scout, one of the fastest American aeroplanes. It is equipped with a 100 H. P. General Vehicle Co.'s Gnome engine. (Photo passed by Censor.)

DIMENSIONS OF STEEL TUBE STRUTS

By CARLO MAURILIO LERICI, Electrical and Aeronautical Engineer

Special Correspondent for Aerial Age in Italy

THE accompanying graphs have been prepared in order to facilitate the calculation of the dimensions of such circular and streamline steel tubes as are employed in aeroplane construction. The diagrams give directly the compression permissible for a maximum load of 10 kg. per sq. mm. (13,750 lbs./sq. in.); that is to say, with a factor of safety of six for steel commonly employed having an ultimate strength of 60 kg. per sq. mm. (82,500 lbs./sq. in., or nearly 37 tons per sq. in.). The streamline section tube is that of minimum resistance (Fig. 1), tested by Eiffel and adopted as standard by nearly all the constructors of the world. The fineness ratio of this section is about 3. The ratio of the two moments of inertia I_{xx} and I_{yy} is about 5. It will be easily seen that there is an almost constant relation between strength in compression of circular and streamline steel tubes.

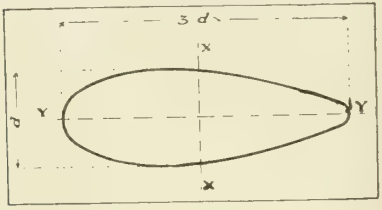


Fig. 1.—Standard section for streamline steel tube

For the standard type (Fig. 1) I have found that the streamline tube whose section has the external dimensions $d \times 3d$ has the same compressive strength as a circular section tube of the same length and thickness (gauge), having an external diameter $= 1.5\ d$. This factor has formed the basis for the graph (Fig. 2). The following data are given: $W =$ normal compressive load, $L =$ length of tube. The graph shows that for each value of W there are generally several solutions according to the different values of the thickness adopted. In this connection it should be noticed that, in order to attain maximum lightness, one should adopt the minimum possible thickness s. The ratio of s to d should not be less than 1/30.

It should also be pointed out that the condition of minimum weight for streamline tubes exposed to a current of air, as the struts of an aeroplane, is only convenient in machines having a low flight speed. Generally it is possible to so dimension these tubes as to render minimum the power absorbed by their weight and by their head resistance. In the best of modern high-speed machines the total power P absorbed by one meter of streamline tube exposed to the air is given by the formula:

$$P \quad \frac{dv^3}{10^6} + \frac{34vds}{10^4} \qquad P = \frac{7.25dv^3}{10^8} + \frac{7.85vds}{10^3}$$

d in cm.
s in cm.
v in metres per second.
d in inches.
s in inches.
v in ft./in.

An examination of this formula gives the following results: (1) For machines having a speed of not more than 120 km. per hour (75 m.p.h.) the minimum value of P is obtained by giving the struts a thickness of between 0.8 and 1.6 mm. ($\frac{1}{32}$ in. and $\frac{1}{16}$ in. respectively). (2) For machines of which the normal speed varies between 120 and 100 km. per hour (75 and 100 m.p.h.) the optimum thickness varies between 1.2 and 2 mm. ($\frac{3}{64}$ in. and $\frac{5}{64}$ in.). (3) For speeds between 160 and 200 km. per hour (100 to 125 m.p.h.) the optimum thickness varies from 1.6 to 2.4 mm. ($\frac{1}{16}$ in. to $\frac{3}{32}$ in.). (4) For speeds above 200 km. per hour (125 m.p.h.) the struts should be given the maximum possible thickness, weight having no longer any appreciable influence.

It sometimes happens that one has to depart from these dimensions giving maximum efficiency in order to avoid during flight every vibration that might diminish the compressive strength of struts. For instance, this happens when the frequency of the struts' proper vibration under normal load coincides with or is a multiple of the number of revolutions of the motor. Such a phenomenon of resonance can be countered by modifying one of the dimensions s or d.

The following examples show the method of using the graph:

(1) *Centre Section Strut.*—Streamline section. Steel of 60 kg. per sq. mm. (82,500 lbs. per sq. in.). Factor of safety = 6. Length, 7 ft. Compression in strut, 670 lbs. Thickness $s = \frac{1}{16}$ in. From the diagram it will be seen that the circular tube has an external diameter of 36 mm. ($1\frac{7}{16}$ in.). Streamline tube having same strength, $d = 36{:}1.5 = 24$ mm. ($\frac{61}{64}$ in.). As the fineness ratio of the strut is three, the dimensions should be about 1 ft. 3 ins.

(2) *Chassis Strut.*—Streamline section. Steel, 60 kg. per sq. mm. (37 tons per sq. in.). Factor of safety, 6. Length 5 ft. Compression under nomal load, 1,020 lbs. Thickness $\frac{1}{32}$ in. The circular tube indicated in the diagram as being of the requisite strength for this load has an external diameter of 45 mm. ($1\frac{13}{16}$ in.). Streamline tube having same strength $d = 45{:}1.5 = 30$ mm. ($1\frac{13}{32}$ in.). As the ratio of s to d is less than 1/30, it will be advisable to adopt a thickness of $\frac{3}{64}$ in. In that case $d = 41{:}1.5 = 27.5$ mm. ($1\frac{3}{32}$ in.).

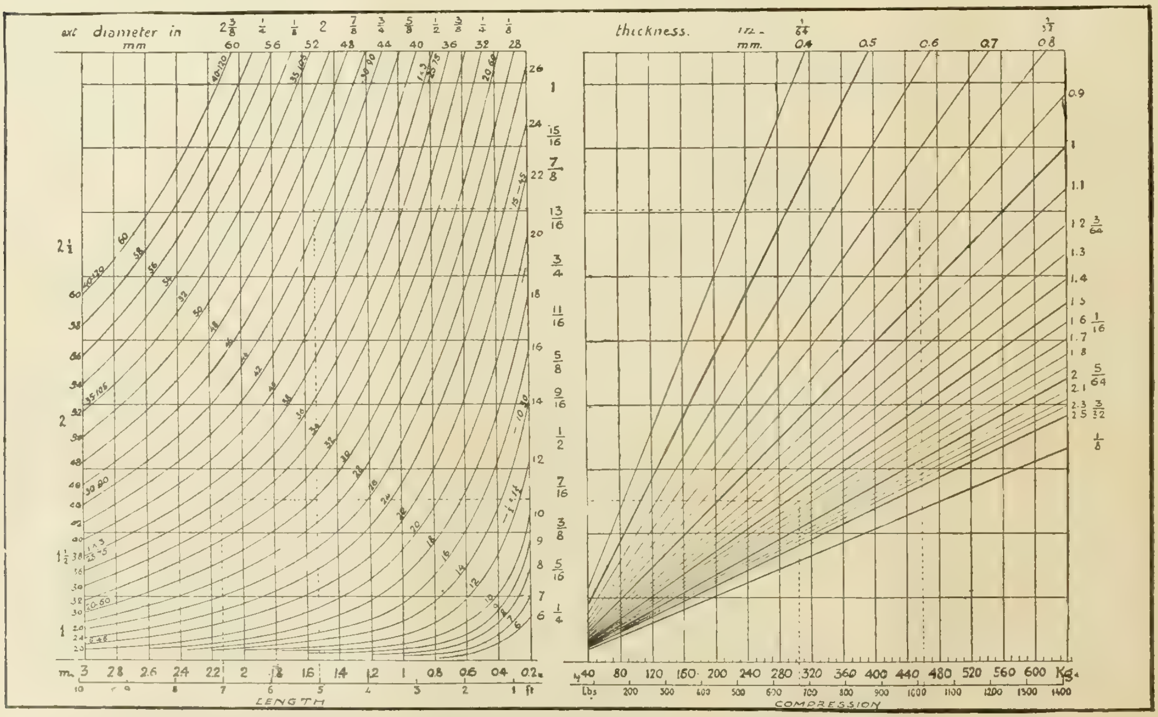


Fig. 2.—Graph showing strength of circular steel tube struts of various dimensions, the material being assumed to be steel of ultimate strength of 37 tons per sq. in. For the section shown in Fig. 1 the values found for circular struts must be divided by 1·5. Other streamline sections would, of course, have different values.

EVERY MILITARY AVIATOR OUGHT TO KNOW WHAT HIS OWN AND THE ENEMY'S MACHINE CAN DO AND HOW THEY LOOK

By HENRY WOODHOUSE

Author of the "Text-book on Naval Aeronautics", "Text-book on Military Aeronautics", etc.

IN three previous issues the writer pointed out that the Allied Government found it necessary to teach their aviators and students all about their own machines, and as much as possible about the enemy's machines, particularly their appearance. As a basic principle, the aviator is taught that what does not look like one of the Allied machines must be an enemy machine. Therefore, every effort should be made to bring it down.

The anti-aircraft forces are taught the same thing, and that knowledge of the features of the different types of aeroplanes is one of the prime factors in making the anti-aircraft forces efficient.

Lacking that knowledge, both the Allied air forces as well as the anti-aircraft defenses, get confused and permit the enemy to get temporary advantages, which cost the lives of Allied aviators, as well as of the population of the cities which are raided—without mentioning the strategic advantages which the enemy gains through gathering information or surprising the Allies.

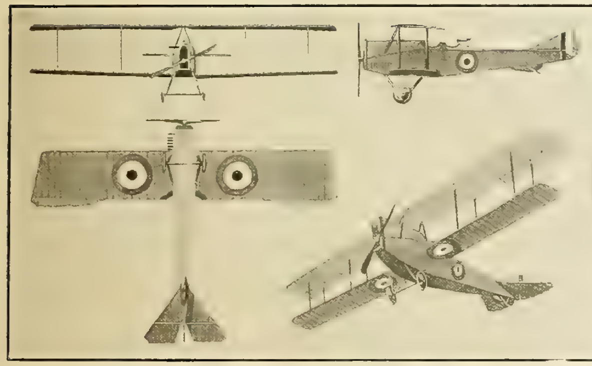
Besides teaching military aviators to know their own and the enemy's machines, what they can do and how they look, the Allied authorities also found it advisable to have continuous progressive changes in their types of aeroplanes.

It was found that German aviators had a certain amount of fear for a new type of aeroplane, because they did not know what it could do and past experience had taught them to beware of appearance. As a member of the Lafayette Escadrille put it: "The Boche was never so surprised as when he attacked a certain type of machine which looked like a two-seater, and got fired on by the third passenger, who was an extra gunner, well equipped with twin Lewises."

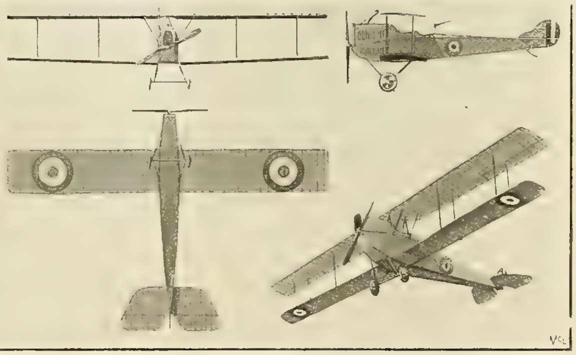
The policy of keeping the enemy "guessing" is good strategy—so long as it does not interfere seriously with production. It can be applied especially in the smaller types of machines used to maintain the supremacy in the air during the daytime on the fronts. It has little value in so far as the large bombing machines used for night bombing are concerned, because the night aeroplanes cannot be seen. It may be deducted from the types of German machines captured that the Germans are also following this policy. They keep up a continuous progressive change of types, adopting the good points of captured Allied machines, adding other points which are suggested by the progress of the science.

The Gothas followed the capture of the Handley-Page bomber, and now the dispatches advise that the Germans are building larger machines equipped with four motors.

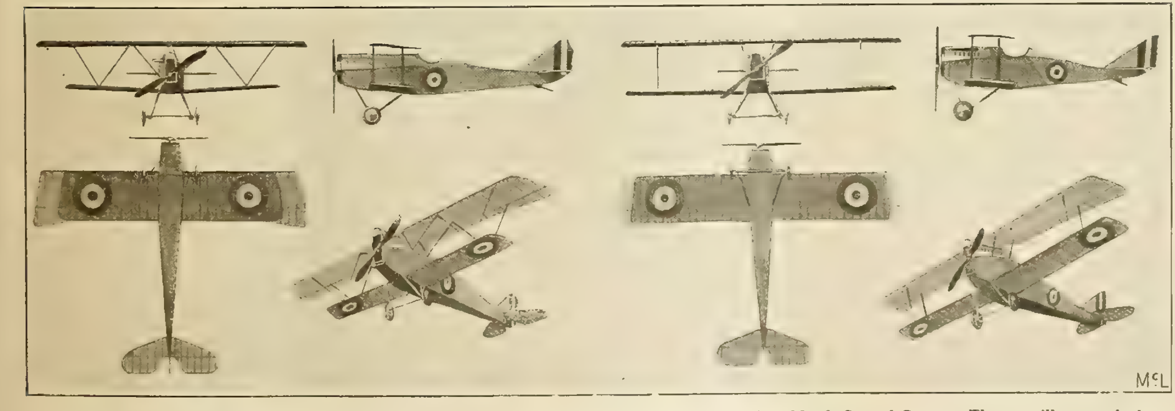
Some of the smaller machines look very much like the French and British machines and it would be hard to recognize one from the other, were it not for the iron cross on the planes. This similarity in characteristics has necessitated closer study of German types and how they look.



Pomilio (Italian). Two place Reconnaissance and Bombardment aeroplane equipped with a 6-cylinder 200 H.P. Fiat engine. Carries a movable Fiat machine gun upon a ring surrounding the rear cockpit, and a synchronized gun firing forward. Ailerons on the upper plane increase in chord as they leave the trailing edge of the main plane. Trailing edges of lifting and controlling surfaces are fluted. The upper part tail skid is enclosed in a sheet aluminum streamline covering which is easily discernable from the side. Upper plane flat in span, but lower sections have a slight dihedral. The Pomilio Co. also builds a fast Scout, which cannot at this time be described.



S. I. A. (Italian). A two-place Combat machine which has recently proven its remarkable power of endurance in a non-stop flight from Turin to London and a 1000-mile flight from Turin to Naples and return. It is equipped with a 6-cylinder Fiat engine, with an exhaust stack leading to the upper plane. Both planes have an equal span. Central braces from the fuselage to upper plane are in the form of the letter W. Trailing edges of plane surfaces are straight and not formed of wire, as in many other Italian aeroplanes. A balanced rudder is used.

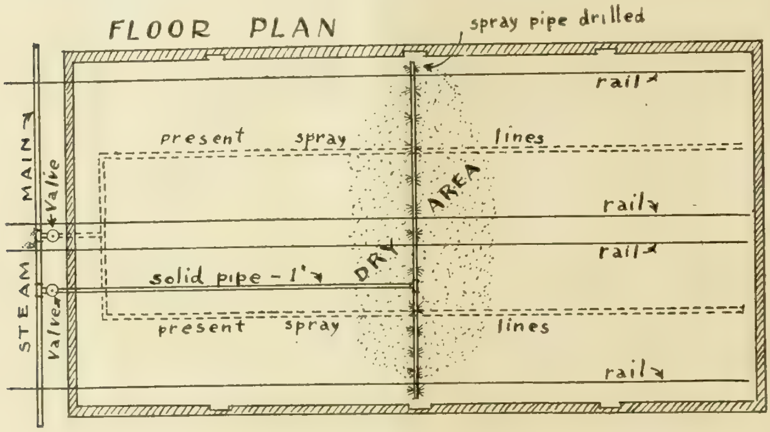


S. V. A. (Italian) Fighting Scout. Several types of scouts are turned out by Gio Ansaldo & Co., of Genoa. The two illustrated above are said to have been used extensively. Both machines are equipped with 210 H. P. "SPA" engines. In the machine at the left the tubular steel struts are inclined laterally, a structural feature which is an identifying characteristic. The body is very deep and proportionately narrow, especially toward the tail. The tail group is somewhat similar to the French Spad, although the tail plane of the S. V. A. is smaller. The machine at the right has a single set of vertical struts at either side of the body, and the struts from fuselage to upper plane slope outward at their top. In both machines, the lower plane has a slight dihedral. There is no stagger nor sweepback. The usual two wheel landing gear and a spring steel tail skid are employed. These machines carry a machine gun at the side of the fuselage, synchronized to fire through the propeller path.

DRY KILNS—A SAFETY FACTOR IN AEROPLANE CONSTRUCTION

By VICTOR R. JOSE, Jr.

"WOULD you want to be the cause of even one United States aviator crashing to earth in a pitiful wreck because the wood you built into his aeroplane snapped in midair?" I recently asked a manufacturer who wanted to know why he should change his methods of drying lumber.



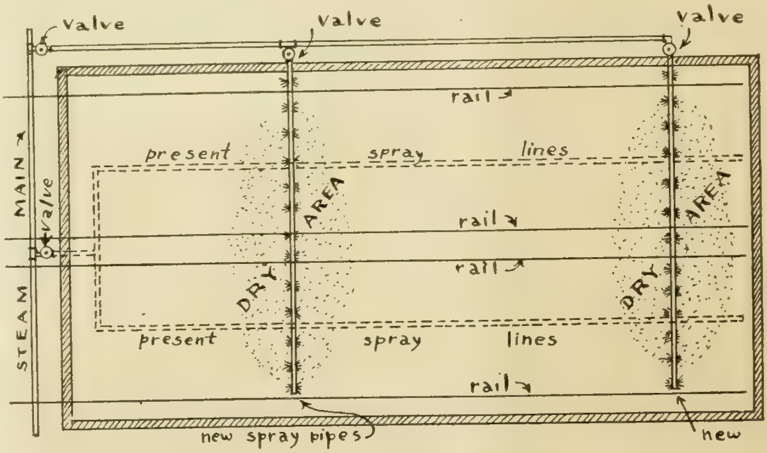
"Well, if that is the situation, we certainly must change our kilns and system. Make your recommendations; results, not costs; in they go!"

With that spirit of patriotism manufacturers are facing the greatest change in the methods of drying of wood since the dry kiln supplanted the smoke kiln. The aeroplane has forced a tremendous awakening in the lumber industry which gives promise of big results and success after the war as well as those already apparent and for immediate use.

The old method was one of extracting the moisture from the wood; literally baking it out; drying the wood. Consequently there developed the commercial "Dry Kiln." The only idea at that time was to get the water out—turn on a supply of heat and pull the water out fast. No one ever weighed a board or thought of examining a sample piece. As a matter of fact, no one in charge of the kilns would have known how because the drying was entrusted to any yard man or laborer who could turn a steam valve. If the lumber had been in "long enough" it was time to pull it out. Whether it contained 12% of moisture or was bone dry only mattered in so far as that the bone dry usually milled easier. You see all this was even before Wrights had reached that preliminary stage of invention where the genius is accepted as a "nut."

There being an abundance of lumber in this land of limitless resources, only the best need be used. There was always a constant stream of fresh material coming in so that the mushroom piles in the yards, tilting this way and that, sprang up above the mill yard fences on all sides. The supply was always ahead of the demand and so the lumber stood in the air and seasoned for months before its turn came. Practically every bit that went into the dry kilns had been previously seasoned in the air-seasoning laboratory of that versatile specialist, "Mother Nature." Ask any number of the older kiln men whether this preliminary drying is necessary and they will chorus "yes." Ask any number of them why, and they will solo any number of reasons.

A meddler came along one day and compared the meager available data. He noted the different systems in use, and he asked about the different temperatures recommended for the drying operation. But success brooks no meddlers; figuring costs had not yet reached the dry kiln out on the edge of the plant. The meddler was soon suppressed.



Along came an insistent domineering chap called "Mars." And in his wake came buyers from the nations abroad. They bought up all the available stock of lumber which had been seasoned by "Mother Nature," and the piles flattened even as they had grown. Spruce, birch, quarter-sawed oak, went as tho rubbed off of a slate. And when "Mars" demanded of Uncle Sam that he build aeroplanes—thousands of them—the kiln operators gasped.

Could virgin spruce and oak, green from the saw, be dried at all? How fast could it be done? How fast *should* it be done? And at what temperatures? These were only the major questions of an endless series that presented themselves.

Then someone added to the burden by "wondering" whether different temperatures and methods might not affect the cells and the strength of the lumber; for when you get down close and look through a miscrscope you are dazed by the omniscient foresight revealed in the wonderful construction of those minute cells, and walls, and passages.

The demand was for supreme strength, for the precious lives of the "Cavalry of the Air"—*our* Cavalry—depended on thin, frail, strips of wood of lightest possible weight and greatest strength upon which the burden rested in flight. And with this sobering demand, and the abnormal conditions with which to meet it, new instruments or at least new methods were imperative. Clear thinking immediately reached this conclusion.

Scores of experiments were made. They developed the conclusions that high temperatures weakened the strength of the wood. Its power to resist shocks was lowered; and the shocks in battle flight are many. Impact tests, vibration tests, bending and strength tests of various kinds, developed curves showing wide differences in specimens seasoned at different temperatures. It was found that spruce should not be started higher than 120 degrees F., and that this temperature should be built up to a maximum of 145 degrees, with the increase gradual according to the amount of moisture in the wood from time to time and *not* according to an arbitrary chart. The speed of drying becomes an individual problem in each case. Instead of an arbitrary number of days for drying determined upon loading the kiln, the drying is determined by the actual reduction of moisture in the lumber.

The moisture content of the lumber is definitely determined in small test discs taken from representative boards. Weighed when cut and again after being thoroughly dried in an electric oven, the loss of weight shows the loss of moisture. From

Officers of Aircraft Manufacturers' Association, together with officers of the Standard Aircraft Corporation. Top row, left to right: B. E. Williams, former secretary, Aircraft Manufacturers' Association; John P. Tarbox, Curtiss Engineering Corporation; Fay L. Faurote, Curtiss Aeroplane and Motor Corporation. Middle row: D. C. Meenan, treasurer, Standard Aircraft Corporation; A. B. Bliss, Burgess Company; A. C. Pope, manager, Wright-Martin Aircraft Corporation of Los Angeles; J. G. Ridenour, vice president, Wright-Martin Aircraft Corporation; C. H. Day, chief engineer, Standard Aircraft Corporation. F. G. Barnard, production manager, Burgess Company; F. W. Atkin, Dayton-Wright Aeroplane Corporation. Lower row: B. S. Foss, B. F. Sturtevant Company, secretary of Aircraft Manufacturers' Association; H. B. Mingle, president, Standard Aircraft Corporation, and treasurer of Aircraft Manufacturers' Association; Frank H. Russell, president, Aircraft Manufacturers' Association; R. I. Ware, Thomas-Morse Aircraft Corporation.

a great number of these, taken from each load, the average moisture content of each and any board in the kiln charge is computed.

Carefully weighed sample pieces, two feet long and of average condition, and three for each 5,000 board feet in the kiln, are placed at various points in the piles. Each one being weighed, the amount of its weight which represents moisture and not wood substance, is computed on the basis of the average obtained from the small discs. These two-foot samples dry under the same conditions as the rest of the charge. They are weighed each day to see how much moisture they are losing, and their condition governs the decisions to advance or retard the temperatures of the kiln.

Experiments also showed that the tendency of the lumber to dry on the surface must also be met and retarded to prevent such conditions as "case-hardening," a condition in which the outer portion drives under stress and sets up a strained condition of the fibers when dry. It was found that "case-hardening" was affected by the humidity of the air as it circulated against the surfaces of the lumber. As in the case of temperatures, so here again a schedule was evolved on the basis of moisture content, running from 80 per cent at the start to 33 per cent at the end. (For oak the range is temperature 105 to 135 and humidity 85 to 40.) Repeated examinations of the air in the kiln are made at frequent intervals by means of instruments known as "Hygrometers," "Hygrodeiks," etc., from which the relative humidity is determined.

Recording thermometers are provided for each 36 feet of length of kiln and on charts in the operating room the patient pen automatically marks the exact condition for every minute of the day and night.

Watching the records as they go down on his chart from hour to hour—weighing samples, reading Hygrometers and "mixing brains with his hands"—the operator controls the evaporation and conditions so that the movement of the water from within the tiny cells and the cell walls is produced and accelerated in such a way as to cause no injury to the structure and no loss of precious strength.

Even in piling the lumber the old haphazard slapstick method has given way to careful stacking with a view to expediting circulation and controlling its course.

The strength of every board is being jealously guarded through the entire process. When the lumber, "on its way to the clouds," leaves the kiln seasoning department it is fit for the world's finest fighters. A tremendous increase in efficiency and safety has been added by modern seasoning.

Government inspectors over every kiln assure the rightly anxious flyer that only the fit will be sent out for his use.

Suggestions for Dry Kiln Operators

Humidity plays such an important part in the drying of lumber for aeroplane uses that it needs the very closest attention. Too much humidity causes no sleepless nights, but the demons of "case-hardening" and "hollowhorning" walk the bed rail at the suggestion of a drop in the relative humidity of your kiln.

In long kilns this problem often becomes quite serious upon close examination of the kiln. Investigation of different sections of the kiln, as, for example, near flues in external ventilating kilns, will often disclose "pockets" or "spotted" areas.

"Pockets" often exist, although the regular points for taking Hygrometer readings show proper humidity readings. For example, in the areas near a ventilating flue, the air, which has passed through the lumber and picked up moisture, is being pulled out so fast that there remains only the dry, hot air coming up through the heating coils. The relative humidity of dry, hot air is, of course, very low. Consequently in that immediate neighborhood a pocket of low humidity exists. Often this affects a whole truck of lumber at that point. This same condition may also affect several points.

The whole kiln can be reached by means of the steam spray lines which usually run the entire length of the kiln. But the fact that they do run the entire length makes them impractical for temporary uses on small local areas.

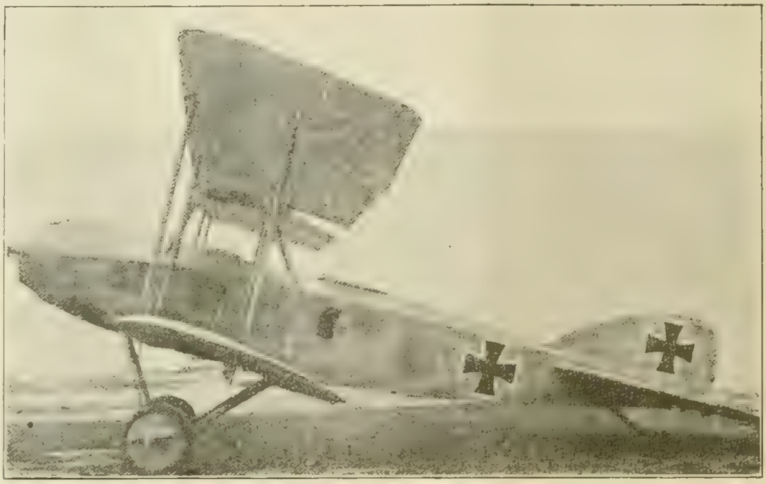
A simple remedy is applied by tapping in on the main steam line with a small spray line; usually a one-inch line is sufficient. Control this line by means of a small hand valve. Run it to the point where the "pocket" occurs, and then across the "pocket area." Along its entire length across the "pocket area" drill 3/16" spray holes on the bottom on about 8" centers. Whenever the pocket occurs turn the control valve for this individual line and let in enough spray to properly humidify the air. If necessary this spray can be left just barely "sizzling" continuously. Control over one area is thus provided without turning steam into the entire kiln, an operation which destroys the working balance of temperature, general humidity and often of circulation.

THE ALBATROS TYPE "CV" FIGHTER

(Continued from page 212)

IN the preceding article on the Albatros Fighter, published by courtesy of "Flight," scale drawings and detail sketches (figures 1 to 7) were shown. This week we deal principally with the fuselage and tail plane.

Fig. 8 shows, in side elevation and plan, the general arrangement of the fuselage, and should, in conjunction with the various sections and key diagrams, explain fairly clearly the general layout of the body. It will be noticed that in plan the sides of the body are straight from the tail post forward to the pilot's cockpit. For ease in manufacture it is an advantage that the ribs of the tail plane should be at right angles to the spars, and in order to effect this it is necessary that the sides of the body should be parallel for the length of the tail plane. Since, however, to provide for this the longerons would have to be changed from a converging direction to a parallel one which would necessitate a somewhat sharp bend in them at the point where the tail plane commences, and as, moreover, the depth of the tail plane is not the same as that of the body except at the extreme rear, a different



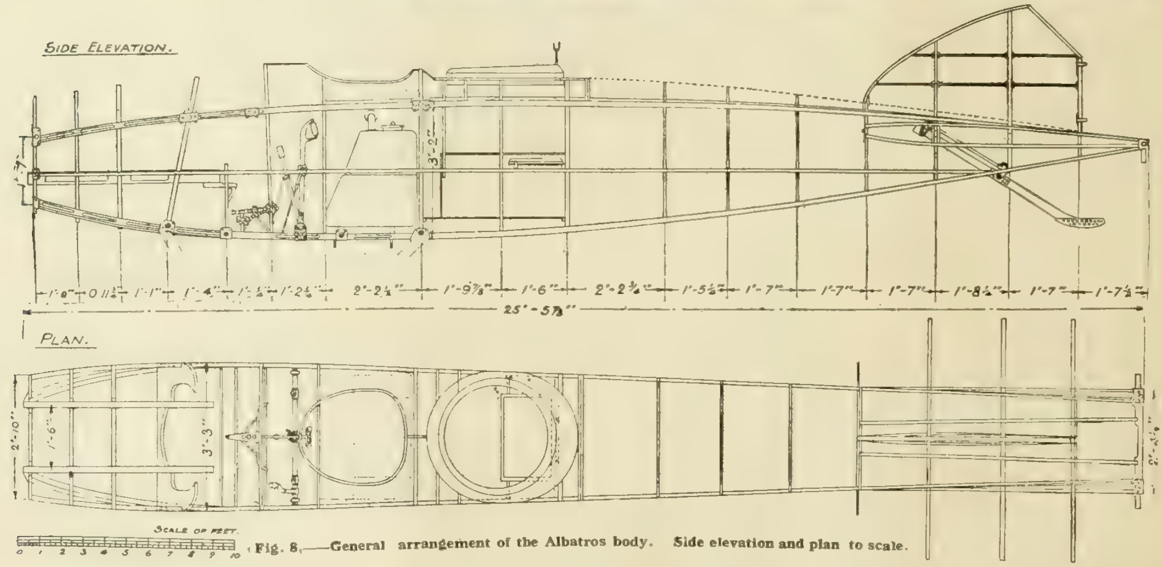


Fig. 8.—General arrangement of the Albatros body. Side elevation and plan to scale.

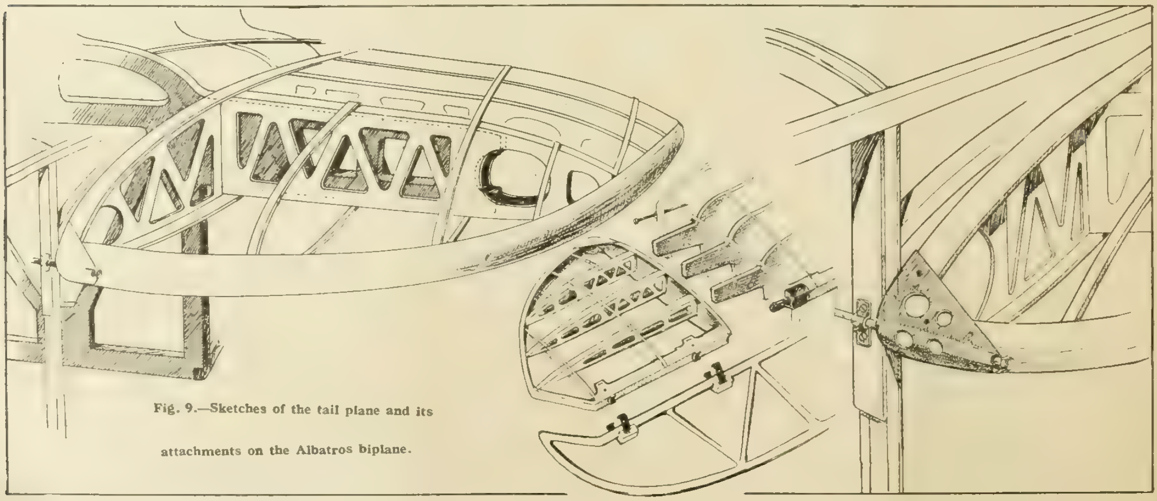


Fig. 9.—Sketches of the tail plane and its attachments on the Albatros biplane.

course has been followed. From the point where the tail begins two extra longerons on each side have been built into the bulkheads of the body. These two short longerons have, in plan, a direction parallel to the line of flight, while the main longerons continue on their converging course. This arrangement is indicated in the plan view Fig. 8. In side elevation the short longerons, against which lie the inner ribs of the tail plane, have the same curvature as the tail plane. In this manner the lines of the rear part of the body are not spoiled, while an easy flowing curve is provided for running the tail plane into the body. The arrangement will be further made clear by reference to Fig. 1, page 224.

Reference has already been made to the peculiar attachment of the tail planes to the body. The sketch at the top of Fig. 9 shows in perspective this attachment, which is also illustrated in the diagram in the bottom left-hand corner of Fig. 9. The bulkheads of the body are extended outwards to form cantilever beams which support the tail plane. There are three of these cantilever beams, while further support is provided for the tail plane leading and trailing edges as indicated in the sketches. The spars of the tail plane are of the box type, built up of ash flanges with thin three-ply sides, cut out for lightness. These spars are so proportioned that they fit over the cantilever beams, which do not, it will be seen, run right out to the edge of the tail plane, but are finished off just outside the second tail plane rib. No external bracing of the tail plane is provided, the depth of it and the method of mounting being relied on for the necessary strength.

To provide against the tail plane sliding off its cantilever supports it is secured at the leading and trailing edge. The former attachment is indicated in the bottom right-hand corner of Fig. 9. A sheet steel shoe fits over the corner of the leading edge and inner rib, and through this shoe a long bolt passes, which runs across the body to a similar shoe on the other side. In Fig. 10 is shown the rear attachment of the tail plane. A sheet steel box surrounds the corner of the fuselage. Welded to this box is a short tube which fits into a circular recess in the end of the trailing edge of the tail plane. As the elevator tube runs right across and is fitted with collars bearing against the sides of the clips that form the bearing for the elevator tube, the trailing edge of the tail plane is prevented from slipping outwards.

The manner employed of forming bearings for the elevator is indicated in the diagrams of Fig. 10. A steel strip is bent over the tube, and its two free ends are bent over and fit into slots in the trailing edge of the tail plane. Each clip is then secured to the tail plane by a vertical bolt as shown in the diagram. The trailing edge of the tail plane is spindled out to a semi-circular section as shown, and a curved metal distance piece is screwed to this trailing edge or spar, so as to form the second half of the bearing of which the bent steel strip forms the other half. To remove the elevator the bolts securing the clips are undone; the clips are then bent outwards until their free ends clear the slots, when the elevator can be removed bodily.

As the elevator is built of steel tubing throughout, wood blocks of the shape shown in detail 1, Fig. 10, are employed for attaching the fabric covering. These blocks span over the steel strip bearings, and are secured to the tubular leading edge of the elevator by screws as shown in section B-B. A hole in the opposite wall of the tube serves for the insertion of the screwdriver.

Under the horizontal stern post of the body are two short tube stumps, closed at their lower ends. The object of these is not at first apparent, since they appear too short to protect the elevator, but when it is remembered that the Germans favor transportation by road, trailing the aeroplane behind a lorry, it becomes at once evident that these stumps serve to support the stern of the body on the floor of a lorry while the machine is trailed behind on its own wheels.

As regards the remaining details of the tail of the Albatros little need be said, as they are fairly evident from the plan and sections of Fig. 11. It will suffice to point out a rather ingenious construction of the leading edge of the tail plane. In plan the tail plane, it will be seen, is roughly semi-circular, and its leading edge therefore has to be shaped to this curvature. As an ordinary strip of solid spruce spindled out to a semi-circular section would scarcely be strong enough for this work, a different method has been employed. It appears that originally the leading edge of the tail is made up of four laminations of ash, having, of course, their grains running in slightly different directions. The rectangular section spar thus formed is then spindled out to a semi-circular section, as shown in the diagram, leaving the impression that the leading edge is made up of seven thin strips of wood glued togeaher. The resulting leading edge appears to be one of great strength, while at the same time being quite light.

(To be continued.)

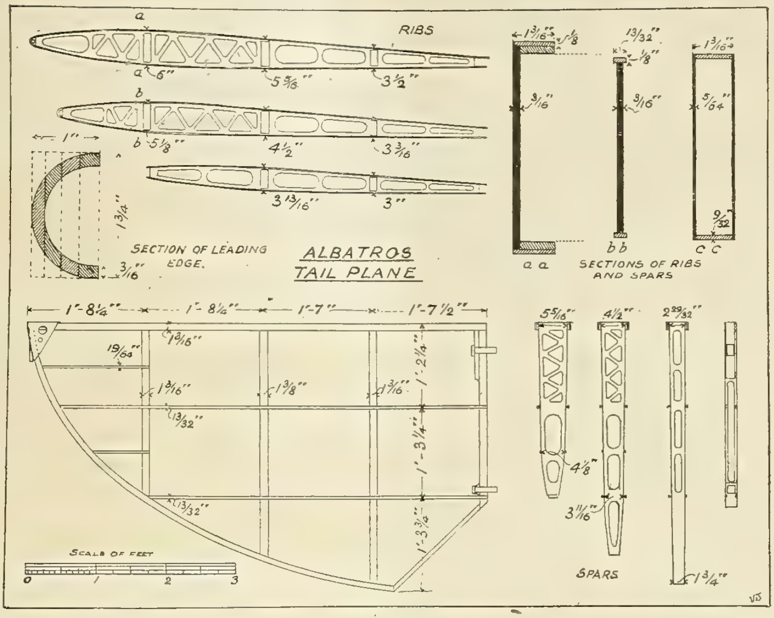


Fig. 11.—General arrangement and dimensions of the members of the tail plane on the Albatros biplane.

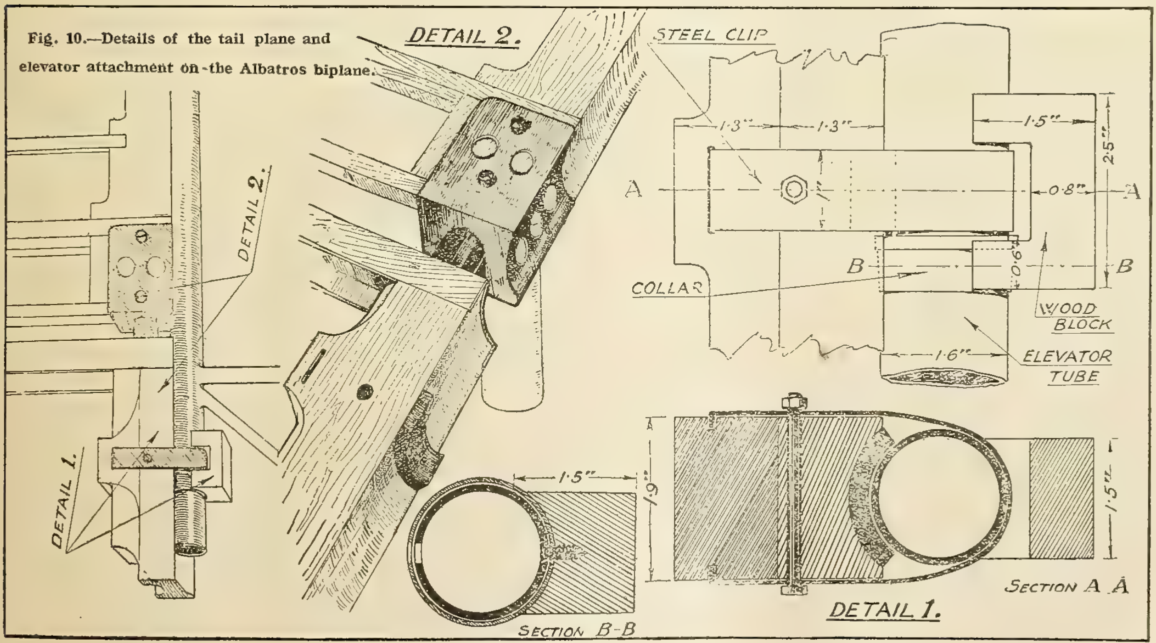
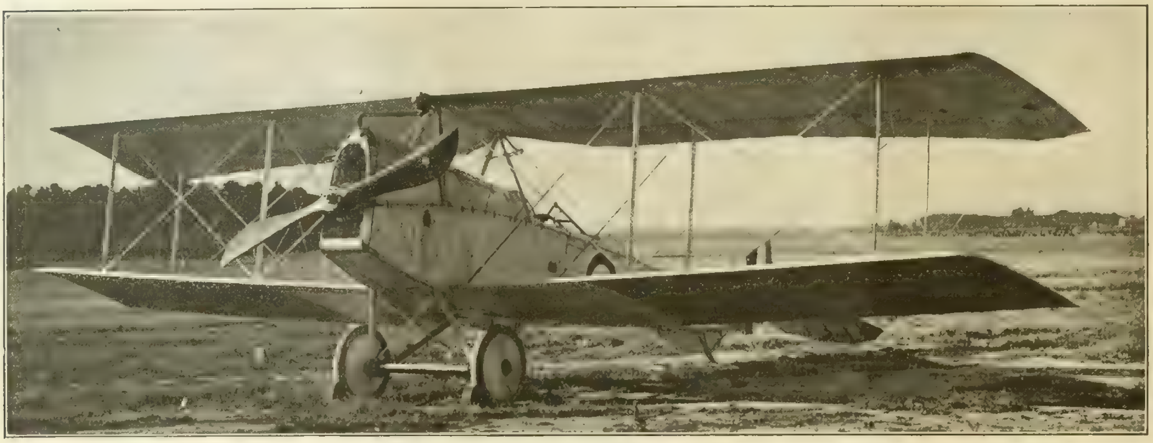
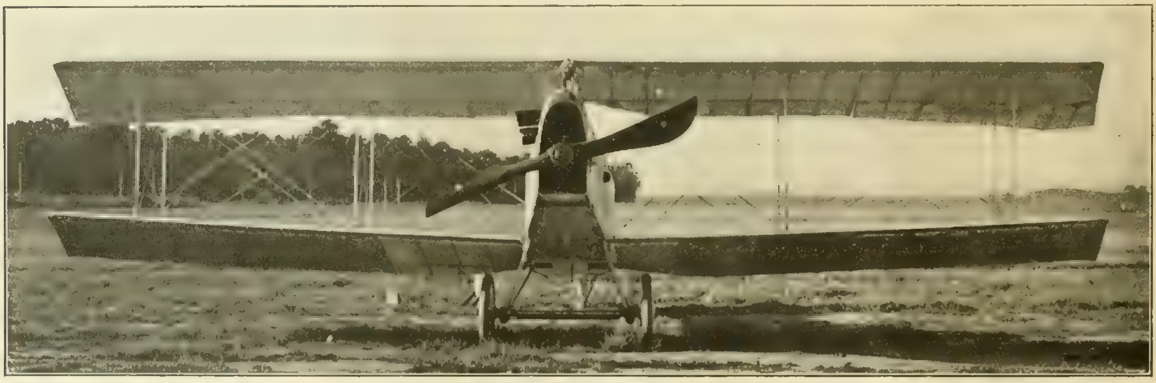


Fig. 10.—Details of the tail plane and elevator attachment on the Albatros biplane.

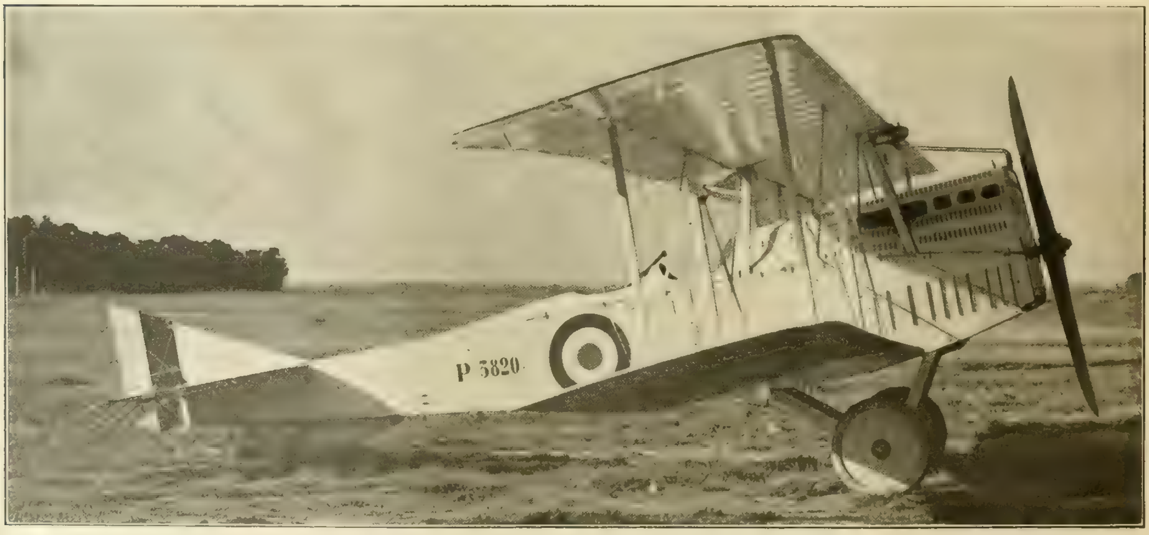
THE POMILIO RECONNAISSANCE TYPE TRACTOR



The latest Pomilio Reconnaissance and Bombardment Aeroplane, one of Italy's powerful weapons of defense against the Austro-Germans. Apparatus is carried for the release of bombs, and a movable machine gun is mounted at the rear cockpit.



Front view of the Pomilio Aeroplane. It has a 6-cylinder 200 H.P. Fiat engine and a Fiat machine gun. Wing span, 38'-0"; height, 10'-0"; overall length, 30'-0".



The Pomilio Reconnaissance and Bombardment Tractor as seen from the side. Official tests have shown this machine to be capable of a horizontal speed of 120 miles an hour. Its climb is also very good, an ascention of 4000 meters being made in 22 minutes.

THE SENATE INVESTIGATION OF THE WAR DEPARTMENT—AIRCRAFT PRODUCTION

Majority Report Urges One Man Control of Air Program

THE Committee on Military Affairs of the Senate, on April 10, submitted the following report on the aircraft situation:

"The Committee on Military Affairs, being engaged under authority of the Senate in an investigation of the War Department, and having taken much testimony, herewith submits the following report in the matter of aircraft production, together with certain recommendations:

Training Schools

"The Signal Corps has established and is now conducting 20 aviation training schools in the United States. Four additional schools are in process of construction and are expected to be finished in June next.

"The aggregate capacity of the schools now in operation is something over 3,000 cadets. One thousand nine hundred and twenty-six have thus far been graduated from this primary training course and commissioned as reserve military aviators. Very few of these have received their advanced training in this country.

"In addition to the above, the Signal Corps, acting upon the invitation of the several entente Governments, dispatched some 1,200 cadets to England, France, and Italy last year, who were to receive primary and advanced training in aviation schools of those countries. The experience of a great many of these men has been most unfortunate in that at some of the schools a very serious delay has occurred in providing them with the training planes, which it was expected would be manufactured in foreign factories in sufficient number. As a result, several hundred of the American cadets have been practically idle and have made no progress. About 450 of them are reported as having completed the primary training after long delay. The Signal Corps is giving serious consideration to the advisability of bringing the remainder back to the United States to be trained. With the exception of this severe disappointment, the primary training of our aviators, according to the testimony of the aviation officials, appears to be progressing favorably. The health record of the schools is excellent and the fatalities arising from aviation accidents, while always distressing, appear to be less frequent than in the schools of our allies, according to the testimony of the Chief Signal Officer.

Training Planes

"For some time after the inception of the work the output of primary training planes in this country for use in our schools gave ground for grave concern. In recent weeks, however, the output has been greatly increased and there seems to be no doubt of the Signal Corps having an amply sufficient number in the future. On April 1, 1918, 3,458 primary training planes had been completed. The planes are of two standard types developed for the purpose and are equipped with Curtiss and Hall-Scott motors, respectively. The advanced training planes are being turned out in accordance with the schedule and estimates laid down at the inception of their manufacture. In advanced training planes four types are being made, the total number up to date manufactured being 342. In these planes three types of engines will be used, of which 965 have been completed. These include Gnome, Le Rhone, and Hispano Suiza, all of foreign design but American manufacture. The Liberty motor is not suitable for use in these planes.

The Liberty Motor

"It is apparent from the evidence that the 12-cylinder Liberty motor is just emerging from the development or experimental stage. Since the original design and the setting up of the first completed motor in July, 1917, a large number of changes have been found necessary, many of them causing delay in reaching quantity production. Within the last two months changes of considerable importance have been made which, it is hoped, will make the motor serviceable for combat planes of the defensive type, and for bombing and observation planes. It is not designed for and can not be used in the swift, single-seater fighting machine. A few of the motors are being flown in appropriate machines. These reports, as recited to the committee, indicate that with the latest changes the motor will be satisfactory for the character of work expected of it and that it bids fair to hold its own with foreign motors of similar power, weight, and purpose. For the campaign of 1919, the Liberty motor must undoubtedly be further improved in order to keep up with the evolution constantly going on along the front. The motor as now manufactured is of the direct-driven type, a type which has limits of usefulness in heavy machines.

"Steps are being taken in the designing of a geared drive, in order that the usefulness of the motor may be further extended and further improvements attained. Twenty-two thousand five hundred Liberty motors have been ordered, 122 have been completed for the Army, and 142 for the Navy. Four have been shipped overseas. Some of those already delivered are being altered to overcome the defects ascertained during the last few weeks. It is understood, however, that these alterations will consume but a very short time. The production of Liberty motors to date is, of course, gravely disappointing. The testimony shows that experts of the highest reputation and experience have, since last July, repeatedly warned the officials of our Government that the perfecting of a newly designed motor must inevitably involve many months of painstaking experiment accompanied by many setbacks and disappointments. In spite of the unanimous testimony of motor experts along this line, the Government officials having the manufacture of the Liberty motor in charge have made the mistake of leading the public and the allied nations to the belief that many thousands of these motors would be completed in the spring of 1918. Information of this sort, not borne out by the facts, has been injurious, and its constant dissemination the committee regards as misleading and detrimental to our cause.

Combat Planes

"The production of combat planes in the United States for use in actual warfare has thus far been a substantial failure and constitutes a most serious disappointment in our war preparations. We had no design of our own; neither did we adopt any one of the European designs until months after we entered the war. Much time was consumed in discussion as to types. Innumerable changes in designs and specifications of the types finally decided upon have cost further delay. In all, five types have, at one time or another, been adopted. Two of them have been abandoned after the expenditure of much time and money. The three remaining types still left upon our program are now in the course of manufacture. Of these, the largest and most powerful is the Handley Page heavy bombing machine, designed to carry as many as six men, eight machine guns, and a heavy load of bombs, and to be driven by two Liberty motors. The history of the negotiations for the adoption and manufacture of this plane afford a remarkable illustration of procrastination and indecision, too long to recite. Suffice it to say that the designs and specifications of this plane which had been used with marked success by the British and placed in production by that Government, were offered to our officials as early as May, 1917. The testimony before your committee shows that the Signal Corps finally decided upon the manufacture of a number of sets of parts of this machine about January 1, 1918. Eventually the finished and tested parts will be shipped to England, where they are to be finally assembled in factories now being prepared for this work. Officials of the Aviation Section of the Signal Corps testify that they do not expect the completion of the first set of parts in this country before the month of June, 1918.

"Another type of combat plane, known as the De Haviland, is included in our program. This machine habitually carries two men, four machine guns, a moderate load of bombs, and other apparatus and is to be driven by one Liberty motor. Fifteen have been completed; 1 has been shipped to France; the remaining 14 have been very recently completed in this country. Some of these have been tested, propelled by a Liberty engine, and appear to have given satisfaction. The third type upon the program is known as the Bristol fighter. This machine is lighter and faster than the De Haviland. Its speed is expected to be in the neighborhood of 125 miles per hour. It is what is known as a reconnoissance machine. Another term which might be properly applied to it is "defensive fighter." It carries two men, four machine guns, and is driven by one Liberty motor. The decision to make this type was reached on November 7, 1917. The manufacturers completed the first of these machines during the week ending March 30, 1918. The machine was tested once during that week with a Liberty motor, and, according to the testimony of the aviation officials, met its preliminary test successfully. This machine, a few hours after its flight, caught fire while standing upon the aviation ground and was entirely destroyed. The officials of the Signal Corps assured the committee that another machine would soon be finished by the manufacturer and that if it met the tests satisfactorily quantity production might be expected within a reasonable period. The testimony as to this machine was given on April 2, 1918. This completes the list of machines now under manufacture and constitutes a correct statement of the situation in this country as of April 1, 1918. In addition to the American production of engines and aeroplanes as herein set forth, considerable orders for combat aeroplanes and engines were last summer placed with European manufacturers by Gen. Pershing, and we have furnished quantities of material and numbers of mechanics to aid in their construction.

"Your committee has full information as to the number and quantity of machines and engines ordered here and abroad but does not feel justified in stating the number in this public report. The facts contained in this report are drawn from the testimony of the Chief Signal Officer, Gen. Squier, Col. Deeds, and Mr. Potter, the chief of the Equipment Division of the Aviation Section of the Signal Corps, and are confirmed from other sources official and otherwise.

"Your committee, being devoid of technical knowledge of motors and aeroplanes, does not undertake to point out in detail engineering and manufacturing errors which may have been committed and which, in part, may account for this gravely disappointing situation. Your committee, however, is convinced that much of the delay in producing completed combat aeroplanes is due to ignorance of the art and to failure to organize the effort in such a way as to centralize authority and bring about quick decision. A certain aloofness in dealing with persons possessing information based upon experience, an apparent intention of confining the actual production to a restricted number of concerns, and a failure of the officials in charge of the work to grasp the situation in a broader way and seize upon the best approved foreign engines and planes and proceed promptly to build as many as possible for the campaign of 1918 has contributed to the failure. It is greatly to be regretted that the statements of Government officials have misrepresented the progress of the aviation program. This has misled the public, and your committee, cognizant of the facts, has, in the performance of its duty, made this report to the Senate.

"Your committee believes that production of aircraft should be controlled by one executive officer, appointed by the President and responsible to him. He should be assisted by a corps of the best aircraft engineers and designers possible to obtain, both European and American. The matter of production should be taken out of the hands of the Signal Corps entirely, and no man who has any near or remote interest in a company manufacturing airplanes or engines should be permitted to act as adviser or be in authority. While we are developing American aircraft and American engines we should temporarily, at least, procure an abundant supply of approved types of aircraft and engines of European design.

"Further, it seems to the committee that every encouragement should be given to the development of aircraft and that any action which retards progress, such as trust agreements or the prevention of those developing machines from flying, under proper restrictions should be removed.

"The committee also believes it to be its duty to point out that thus far no broad plan looking to future development has been laid down by the authorities. Warfare in the air is still in its infancy and it is inevitable that rapid changes will take place in both engines and planes. It is essential to our success that those in charge of the American aviation development shall be constantly looking ahead and devising plans for a continued expansion of the program, as well as the development of new types of engines and planes."

THE MINORITY REPORT

The minority report follows:

"We do not believe that the report of the majority of the Senate Military Affairs Committee on the aviation situation shows a proper estimate of what is being accomplished or that it is sufficiently complete to give an accurate impression of the facts.

"Soon after the war began the Signal Corps arranged with the French Government for the making of 6,100 combat planes at a total cost of $127,000,000, the planes to be produced as rapidly as American fliers could be trained to operate them. As the American aero squadrons reach the front ready for duty, battle planes are being supplied them under this arrangement. To aid in this foreign manufacture of planes for American fliers, the Signal Corps has shipped to France 11,000 tons of various materials and has sent 7,000 mechanics to release for French factories making planes for our American fliers the French workers on motor transports. The Signal Corps then arranged for the making of about 11,500 combat planes in the United States, the term combat plane being here used to embrace all kinds of planes, both offensive and defensive, except training planes. The Curtiss Aeroplane Corporation, the Dayton Wright Aeroplane Company, the Fisher Body Company, the Standard Aero Corporation, the Grand Rapids Aeroplane Company, W. H. Mullen & Co., and about nineteen other companies throughout the country were engaged for the production either of completed machines or of spare parts.

"Let it be said here that when the war began the United

States Government had purchased altogether less than 200 aeroplanes in its entire history, and that of the few aeroplanes factories in this country probably not one was making over five or six a month. It is hardly possible to grasp the magnitude of the task the factories contracting to make the 71,500 combat planes found before them. New plants had to be constructed, old ones fundamentally changed. Special tools for the making of the planes had to be devised and manufactured, and mechanics had to be trained to make the tools and also to make the planes after the tools had been completed. An aeroplane, especially the battle aeroplane, is one of the most highly technical, delicate, and complicated machines known to man. In no other form of machinery is absolute and painstaking accuracy in the smallest details more indispensable. It has about 4,000 parts, and requires from 1,800 to 2,800 different drawings in the preparation for its manufacture—almost as many drawings as are required for a battleship. Every part is strained to the utmost while the machine is in the air, and the slightest break almost anywhere means instant disaster.

Perfection Necessary to Safety

"When it is remembered how often the wheels of railway trains, due to hot boxes, etc., parts of railway and automobile engines, tires on automobiles, etc., go wrong, necessitating immediate repair, and that any similar breakdown in an aeroplane would mean, as a rule, death to its occupants, some part of the responsibility and difficulty involved in making a finished plane may be understood.

"Remember further that every fighting plane must have machine guns, synchronizing devices, special telescope aeroplane sights, wireless apparatus, cameras of special type, electric heating devices for clothing, oxygen apparatus, speed indicators, special gauges, barometers, compasses, altometers, etc. To say that this complicated equipment is in steady and adequate production, and that the factories are now about in shape for quantity production of combat planes, and have about completed the foundation for what is as difficult and responsible a task as has ever fallen to the hand and brain of man, is to state the truth and at the same time to recite an achievement unparalleled in all history for so short a time.

"Remember again that when these combat planes were contracted for the only known lubricating oil adapted to their delicate parts was an oil made from the castor bean. There were not enough beans in this country to make anywhere near the amount of oil required. Neither were there enough seeds with which to grow the needed quantity of beans. The Signal Corps had to search the globe for seeds, and finally secured a shipload from distant India. Then the corps had to contract for the planting of the seeds in this country, and has succeeded in having about 110,000 acres planted. It is now claimed that a form of petroleum has been developed that will answer the same purpose. This, however, is still in the experimental stage, while the oil from the castor bean is known to be entirely adequate and reliable.

"Remember again that the cloth used in the wings of the aeroplanes of all types had to be treated with acetone, a liquid substance which makes the cloth as fireproof as possible, and also strengthens it for the immense strain to which it is subjected in the air. The Signal Corps is having this acetone distilled from wood under its own supervision on an enormous scale, and at a cost of about $20,000,000.

"The corps has had to find a substitute for Irish linen, as the material for wing cloths on training planes, and has succeeded in adapting a certain form of long staple cotton to this need.

"Coming to the training plane, it may well be said that the completion of 3,500 to date and the fact that they are now on quantity production, practically according to program, constitute a remarkable achievement when the nature of the task is fairly weighed. The training plane is simpler than the battle plane, and for that reason could be produced sooner, but the making of the training planes on a quantity scale is in itself a task of unprecedented difficulty and magnitude.

"Let it be remembered further that the Signal Corps had to put regiments of workers in the forests to find the spruce needed in the making of aeroplanes. The spruce trees are found among fir and other trees, and of each 100 feet cut only about 15 per cent is found good enough for aeroplane construction. Approximately 1,000,000,000 feet of lumber had to be cut and inspected and tested before the necessary 100,000,000 feet of spruce could be obtained.

"Propellers are made from mahogany and other highly durable woods, and three or four must be made for each machine. This mahogany comes from the tropics, and whether and when it can be brought to seaport depends on tropical rains, which swell the rivers so as to permit transportation.

Defends Liberty Motor

"Let us now consider the Liberty motor. The Liberty motor could not fairly have been called an experimental and untried device. It represented a combination of what had been demonstrated to be best in all motor construction. The Signal Corps, with its trained and skilled engineers, understood that a foreign motor could not be adapted to American manufacture and turned out in sufficient quantity in anywhere near the time in which the Liberty motor could be produced. Foreign motors are based on the metric system of measurements, etc. American practice and American manufacture are not adapted to this system. All parts made under the metric system must be converted into inches and fractions of inches under our system. The foreign motor is so extensively the result of hand work that it is with great difficulty adapted to the machine work that dominates American factories.

"Furthermore, the Liberty motor is capable of one hundred more horsepower than any foreign motor except a few of one single type, the Rolls-Royce. The Liberty motor develops 400-horsepower ordinarily and is capable of 465. The foreign limit, with the one exception above mentioned, is 300.

"The Liberty motor has become so well established that the British Government has asked for a large number. Sir. William Weir, head of British aircraft production, stated recently in London that he considered the Liberty engine the greatest single factor in the world's aviation program; that it was the most important single thing in the air program of England in 1918.

"As soon as the Liberty motor had been designed, arrangements were made for the manufacture of a very large number before the close of 1918. The exact figures are withheld for military reasons. Henry Ford agreed to produce a substantial number of the total, the Packard another portion, the Lincoln Motor Company, Nordyke & Marmon, General Motors, and the Trego Company still another portion. These companies were notified to get ready last summer and the actual contracts were signed later. They have spent the intervening time preparing plants, tools, and workmen for this unprecedented work and are now on the eve of quantity production. The very names of those manufacturers are sufficient assurance that they would not take a day longer than necessary to lay proper and efficient foundations.

"The foreign planes which were accepted by the Signal Corps, known as light battle planes or single seaters, for which the Liberty motor is too heavy in horsepower, were none of those offered by foreign concerns that came to America soon after the war began to sell their wares, except the Handley-Page, and that was not the plane which the Handley-Page people first offered our Government on this side. Indeed, when the Handley-Page plane was first offered here it was untried and undeveloped, and had not been accepted by the British Government. The Signal Corps sent a commission abroad to study foreign planes on the ground, and accepted certain ones only after careful and personal study.

"On the whole the record of the Signal Corps is one of which every American can be justly proud. In the face of unparalleled difficulty it is accomplishing an unparalleled task with characteristic American energy, capacity, patriotism and enthusiasm."

The Vote in the Senate Committee

The majority report was signed by Senators Chamberlain, Chairman of the committee; Hitchcock, Reed, and Thomas, Democrats, and Weeks, Wadsworth, New, Frelinghuysen, and Sutherland, Republicans.

Senators Sheppard of Texas, Myers of Montana, and Kirby of Arkansas, all Democrats, put in the minority report defending the Administration and insisting that it has faced extraordinary difficulties that were not easily overcome.

Senators Fletcher, McKellar, and Beckman signed neither report.

W. A. MORGAN, LATE VICE-PRESIDENT OF THE CURTISS COMPANY, TELLS OF CONDITIONS THAT CAUSED AIRCRAFT PRODUCTION DELAY

IN a special interview with a representative of the New York *World*, Mr. W. A. Morgan, late vice-president of the Curtiss Aeroplane and Motor Corporation, discussed the conditions causing delays in production as follows:

"I joined the Curtiss Company on July 16 last. After sizing up the possibilities of the concern and talking to its staff of experts we went to Washington and consulted with the Aircraft Board as to the number of aeroplanes we could turn out. We figured conservatively that we could produce 3,000 pursuit 'planes and 1,000 bombers, from January 1 to July 1, 1918. The members of the Board said that if the $640,000,000 appropriation for our air service went through, they would give us a contract for that number of machines.

"At that time, understand, the appropriation had not yet gone through. But, relying on the word of the Board, we hurried back to Buffalo where I had taken an option on a piece of land and closed for it. The land and the necessary buildings for the work we purposed to do cost about $5,500,000. The Curtiss Company was not in a position to swing such a big deal and so I personally went out and borrowed $4,000,000 from a banking house. We got busy and began putting our buildings up within a few days. We had to send to Canada for some of the steel—but we got it into the country cheaper than we could have bought it here.

"Erection work was begun on July 27, and by September 15 we had 540,000 square feet of space inclosed. And up to this time we did not have the contract. I was staking everything on the word of the Aircraft Board.

Contract Signed, Then Cancelled

"The contract was signed on September 19. It was changed a little, so that it ordered 3,000 pursuit machines—fighting machines—and 500 heavier bombers. By November 2 we completed a second building and had a total of 1,170,000 square feet of space. We were ready to go ahead with our job—a $30,000,000 contract.

"But on November 7 last they cancelled the whole contract. This was because of the first of the many, many changes in design. The pursuit 'plane that we were to build was a copy of a certain French machine—a very good fighting 'plane which is still good enough to be in use in considerable numbers by the French. It was a single seater.

"But it seems that the Kaiser had sent some two-seaters over Verdun; that is, machines from which the pilot fired from the front and his companion had a second gun which he could fire at any 'plane which was chasing him. So the Aircraft Board immediately countermanded our order and set about to get a two-seater design. They accepted the Bristol, which is an English machine.

"We could have turned out the original 'plane ordered of us in great quantities very quickly. We could have begun production in December and got into quantity production in January, perhaps at the rate of 500 a month. We could have turned out any sort of 'plane they wanted, even the Bristol Fighter, at that rate, but we could not get the definite go ahead.

"My own belief is that it would have been far better to have made some of the original type; to have had 1,000 of them over there now protecting our lines, rather than to have none over there. We can't fight with designs. We have to fight with actual 'planes.

A Complete Halt

"Naturally, there was a complete halt when our contract was cancelled, but to make up for this cancellation the Board sent us word to go ahead and build 600 'planes of the 'advanced type.' This is a two-seated, dual-control machine which I may not describe in detail. But we showed them, with this ''plane,' what we could do in the way of production. We had a sample finished and in the air within ten days, and I believe the 600 have all been turned out and shipped by now.

"Finally we got our order for the Bristol Fighters. The contract was for 2,000.

"From the very beginning we were never able to get a definite 'go-ahead' order, so we could rush the production of this machine. We were, it must be remembered, maintaining immense overhead expenses. I personally was morally responsible for a $4,000,000 loan. Not that I cared so much about that. I'd give every cent I have to be able to feel that we'd turned out a great quantity of machines, that they were protecting our fighters, and that I had aided in doing this, as my contribution toward winning the war.

"Well, on November 28 the Executive Committee of the Curtiss Company wrote a strong letter to the Aircraft Board and told them that we were not responsible for any delays there had been, and that on account of these delays, which were not our fault, we felt that the Government should finance our operations—at least those extensions which we had made. This they agreed to do, and in January they took up our $4,000,000 mortgage.

Hundreds of Changes

"The changes that the Board ordered in the Bristol Fighter were literally hundreds. Their first great difficulty was about a motor. They decided primarily to use the Liberty eight-cylinder (which, as is now known, has been entirely discarded); but they found that would not fit in the Bristol. Then they decided upon a certain type of French motor, and then upon another type of French motor of greater power.

"These changes, of course, caused important changes in the machine, its balance and so on. Then they could not seem definitely to decide upon what sort of machine gun to use. They would order one kind, then another, then revert to the first again.

"This necessitated alterations in the machine proper and alterations in the gun mounts. Then a certain sort of instrument would be ordered and abandoned and another type ordered and abandoned. We never knew where we were—and here was a force of 11,000 men literally straining at the leash, ready to give all their strength and skill to the job of fast production."

"Any idea that reached here from abroad was seized by those in charge of our air programme," Mr. Morgan said. "It was a case of constantly copying something. In our air programme, I have found, no encouragement is given to American companies and American designers to produce something of their own.

"I do not want to appear to be holding a brief for the Curtiss Company alone. I know that all the others have had the same experience. But I do want to stick up for the American manufacturer in general, and I want to assert that we Americans can—and will if we are permitted—turn out as good aeroplanes as Germany does, and a great many more than Germany can turn out. We can produce enough to blind the Kaiser's armies if the authorities will let us go ahead.

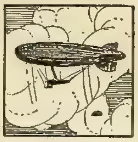
No Trick to Do It

"It is no trick to turn out aeroplanes by the thousands—and I believe they will win the war—if the authorities will only decide what they want. But they hadn't the last I heard."

"What is the remedy for the situation?" Mr. Morgan was asked.

"Stop tinkering and let the manufacturers alone!" he replied. "As Mr. McNab of the President's Investigating Committee was quoted as saying the other day, if the authorities want to tinker let them get a big tract of land down in Virginia and tinker to their heart's content. Meanwhile the manufacturers will be producing."

MILITARY AEROSTATICS



HOW KITE BALLOONS DIRECT ARTILLERY FIRE

A CORRESPONDENT of the Associated Press, writing from "behind the British lines in France," describes his experience in a kite balloon observing artillery fire as follows:

"Would you care to go up?" asked the polite British officer in charge of the big kite balloon, one of the long line of captive sausages, the "eyes of the army," which swing as though pendant from the clouds all up and down the fighting line from the British channel to the Swiss border.

"Certainly," replied the correspondent, and so an extra warm overcoat and muffler were brought out and donned and, most important of all, the parachute harness was fitted on.

By this time the balloon had been connected up to the winch and everything was ready. The officer hoisted himself into the car with an agility born of long practice, while the visitor was assisted to his place by the "car men," who then hooked the harness to the parachute which hung just outside the little wicker car.

The Balloon's Equipment

Jutting out from one side of the car was a board on which was pasted a large-scale trench map of the district. In pockets inside the car were maps, air photographs and field glasses. On the rigging of the car was a dial to show the altitude and an indicator registering the force of the wind in miles per hour.

Just above, dominating all, was the huge bag of floating fabric, only kept in place by the crowd of soldiers holding the handling guys. The slender cable and its sister telephone wires stretched lazily across the grass to the winch on a big motor lorry nearby.

The observer fixed the telephone receiver to his head. He tested the line by calling up the winch party, the exchange and the chart room at the balloon section headquarters. Satisfied that all was ship-shape, he waved his arm to the flight-sergeant on the ground, who ordered crisply, "Let up hand over hand," and then, "Walk toward the winch."

Felt Shaky At First

The ground began to sink away. The first impression was that the bottom of the basket was going to fall out. For a few moments this impression was so strong that it was physically impossible to look over the side. The view was excellent, but the mood to appreciate it was absent. The officer's enthusiasm, as he pointed out different objects of interest in the landscapes, seemed somehow overdone.

Gradually this first impression of insecurity passed. The altitude dial, comfortably close at hand, now indicated that the balloon had reached 2,800 feet. The thermometer already showed a drop of twenty degrees. But the balloon was still rising.

"There is a light ground mist," explained the officer, "and experience proves that under such circumstances better results are obtained from higher altitudes." So it was not until the pointer signified 4,200 feet that he telephoned down the order, "Stop the winch," and the business of the day began.

Guided Battery Below

Artillery observation was the officer's appointed task. A British battery was going to "take on" a German battery, and the observer made his preparations accordingly. He had the positions of the two batteries marked on his map, but he wanted to make sure of the position of the balloon. So he leaned out over the side of the car, verified his landmarks and telephoned the results to the chart room.

"Let me know when they are ready," said he. There was a pause. Then a short monosyllabic conversation and the balloon officer gave the order, "Fire!" and adjusted his glasses to his eyes.

For the next fifteen minutes the officer was too busy to pay any attention to his passenger. He was engaged in "ranging," but from time to time he passed down a remark which showed that he was not confining his attention to ranging guns, but had also an alert eye for flashes of enemy guns anywhere within his range of observation. The range of vision was roughly twenty miles.

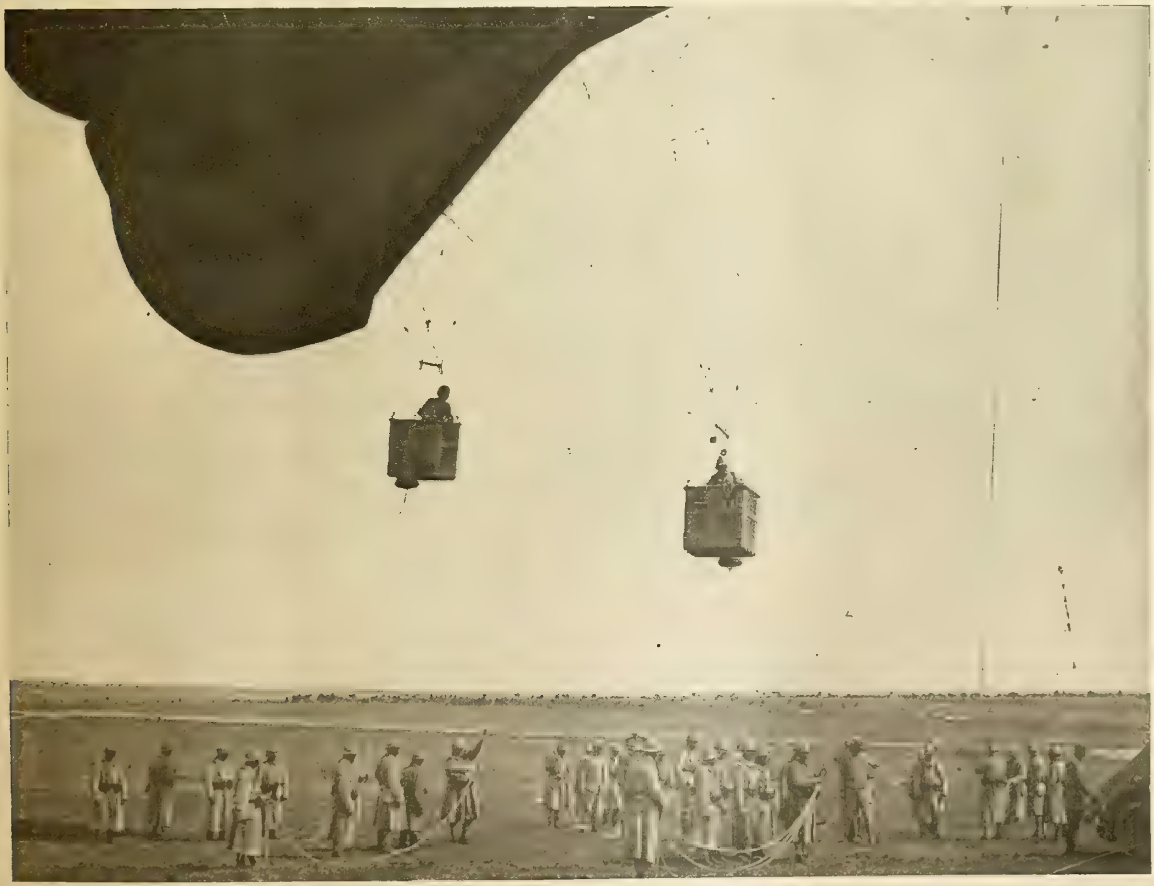
Phones Down Correction

After the first order to "Fire," a boom in the distance indicated that the order had been obeyed. The balloon officer frowned slightly, and telephoned a correction. A moment later the battery announced again that it was ready, and this time result was better. The process continued.

Once the observer asked to be put into direct communication with the battery, and the exchange arranged accordingly. Apparently the result of this conference was satisfactory, for soon the observation came through as correct.

A few more rounds and the balloon requested the battery to start firing for effect. While this

(*Continued on page 264*)



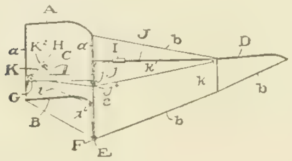
Twin basket Cacqout observation balloon starting on an observation flight. (French Official Photo.)

RECENT AERO PATENTS

BY WILLIAM N. MOORE

1,258,279. AEROPLANE. Frederick J. Veitch, New York, N. Y. Filed April 15, 1912. Serial No. 690,686. (Cl. 244—29.)

An aerocraft embodying a plurality of feight-carrying planes, a balancing plane in the rear of said weight-carrying planes, said balancing plane occupying an immovable position with reference to said weight-carrying planes, a lateral stabilizing and steering weight supported below the lower of said weight-carrying planes, means for controlling and adjusting the position of said weight with relation to said weight-carrying planes, a stabilizing vertical steering weight supported for movement between the weight-carrying planes and the balancing plane, and controlling means for shifting and retaining in position said vertical steering weight.



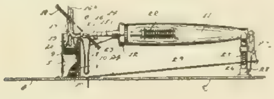
An aerocraft having independent slidable weights for steering the same in horizontal and vertical directions, in combination with two operating spindles one of which is tubular and incases the other, hand wheels on said spindles, and operative connections between the spindles and said movable weights.

An aerocraft having movable weights for steering the same in horizontal and vertical directions, in combination with two operating spindles one of which is tubular and incases the other, hand wheels on said spindles, and operative connections between the spindles and said movable weights.

An aerocraft having movable weights for steering the same in horizontal and vertical directions, in combination with two operating spindles one of which is tubular and incases the other, hand wheels on said spindles, and running cords operated by the spindles and connected to said weights.

1,258,356. AERIAL MACHINE. Albert W. Myers and Robert R. Fitz Gerald, Ottawa, Ontario, Canada, assignors to Albert W. Myers, Ottawa, Ontario, Canada. Filed August 29, 1917. Serial No. 188,853. (Cl. 244—21.)

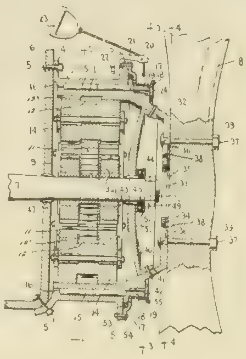
A safety attachment for aerial machines consisting of a parachute, a trip-member adapted to engage at the free end of the parachute, means for disengaging said trip-member, a means for holding the other end of said parachute, a means for releasing said holding means when said parachute is in a vertical position, a means for releasing the opening of said parachute, an attaching means between said parachute and said air craft, and means for shooting said parachute into the air.



1,258,450. AEROPLANE-STARTER. Merrill Pepperd, Wilmore, Kans. Filed September 5, 1917. Serial No. 189,826. (Cl. 74—54.)

In a starter of the class described, the combination of a stationary cylindrical housing, supporting means for said housing, a rotatable drum journaled within said housing, a centrally arranged shaft, an internal gear face within said drum, a train of gears interposed between said internal gear face and said centrally arranged shaft for accelerating the rotation of the shaft in relation to said drum, an oscillatory rim surrounding a portion of said drum, pawl and ratchet means between said rim and drum, and a flexible operating cable surrounding said oscillatory rim and attached thereto.

In a starter of the class described, the combination of a stationary cylindrical housing, supporting means for said housing, a rotatable drum journaled within said housing, a centrally arranged shaft, an internal gear face within said drum, a train of gears interposed between said internal gear face and said centrally arranged shaft for accelerating the rotation of the shaft in relation to said drum, an oscillatory rim surrounding a portion of said drum, pawl and ratchet means between said rim and drum, a flexible operating cable surrounding said oscillatory rim and attached thereto, and a return spring for actuating said drum in the opposite direction.

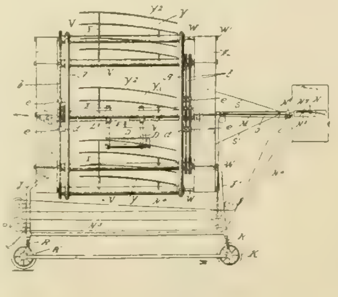


In a starter of the class described, the combination of a stationary cylindrical housing, supporting means for said housing, a rotatamle drum journaled within said housing, a centrally arranged shaft, an internal gear face within said drum, a train of gears interposed between said internal gear face and said centrally arranged shaft for accelerating the rotation of the shaft in relation to said drum, an oscillatory rim surrounding a portion of said drum, pawl and ratchet means between said rim and drum, a flexible operating cable surrounding said oscillatory rim and attached thereto, said pawl and ratchet means comprising a ratchet face on the drum, a pawl adapted to co-operate therewith and pivotally carried by said oscillatory rim, yieldable means normally holding said pawl out of engagement, and means operated upon by said cable serving to press the pawl into engagement with the ratchet face.

In a starter of the class described, the combination of a stationary cylindrical housing, supporting means for said housing, a rotatable drum journaled within said housing, a centrally arranged shaft, an internal gear face within said drum, a train of gears interposed between said internal gear face and said centrally arranged shaft for accelerating the rotation of the shaft in relation to said drum, an oscillatory rim surrounding a portion of said drum, pawl and ratchet means between said rim and drum, a flexible operating cable surrounding said oscillatory rim and attached thereto, said pawl and ratchet means comprising a ratchet face of the drum, a pawl adapted to co-operate therewith and pivotally carried by said oscillatory rim, yieldable means normally holding said pawl out of engagement, and means operated upon by said cable serving to press the pawl into engagement with the ratchet face, said yieldable means also serving to press the last named means outwardly to permit the pawl to move out of engagement with the ratchet face.

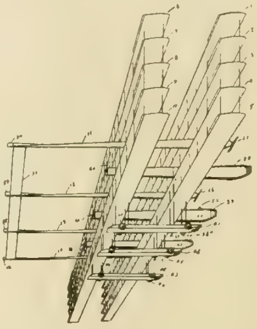
1,258,943. FLYING-MACHINE. Edmund Hugh Pryce, New York, N. Y. Filed December 15, 1911, Serial No. 665,906. Renewed July 30, 1917. Serial No. 183,638. (Cl. 244—14.)

In a flying machine, a central relatively stationary element, a frame mounted on said element and rotatable relative thereto, shafts carried by said frame and rotatable therein, supporting planes carried by said shafts to sustain the machine by the sustaining action of the air exerted through the rapid forward motion of the machine, means for automatically controlling the rotation of said shafts through the rotation of the frame relatively to the stationary element to maintain the planes in proper position to sustain the machine, and means for propelling said machine.



1,259,083. AEROPLANE. Isaac Covino, West New York, N. J. Filed October 25, 1917. Serial No. 198,529. (Cl. 244—14.)

An aeroplane of the multiplane type, having two sets of multiplanes, a tractor system of propulsion composed of four propellers and their respective motive powers located each on a separate body; said bodies being far apart so that equilibrium is maintained when flying; an after system of propulsion composed of three propellers with their respective motive powers all located at the rear end of the larger bodies, a horizontal rudder located at the rear end of the four tractor bodies, four vertical rudders located at the end of each of the four tractor bodies; landing wheels to allow aeroplane to move on land and pontoons to allow aeroplane to float and move on the surface of the water, all substantially as described.



(*Continued from page* 263)

was being done, another battery was rung up and ranging done on another target, the balloon observer occasionally switching his glasses to the old target to see that the guns were shooting correctly,

Now and again the observer passed down a message to the effect that "Blank-Blank is active." Blank-Blank was another hostile battery, not at present engaging attention. Sometimes he interpolated a little message for the chart room such as:

"Flash observed two five minutes left of Blank-Blank," Blank-Blank being a landmark easily found on the map, so that the flash position could be marked on the chartroom for attention later.

Results of the Work

There were four hours of this work before the officer gave the order, "Haul down." A slight jerk showed that the descent had begun, and fifteen minutes later terra firma was reached and the balloon was off upward again with a fresh crew.

Down in the chartroom the report of the day's work so far showed that three German batteries had been "neutralized" and two new battery positions discovered. In due course, the latter two would be cared for in a manner that would place them also on the list of neutralizations.

Not every balloon ascent is so smooth and peaceful as this. The enemy is active and ingenious. and the parachute is not there for nothing. The German airman, swooping like a hawk from a cloud, is always a possibility.

FOREIGN NEWS

AUSTRIA

The Cologne *Gazette* says that an aerial mail service is being established between Vienna and Kiev and also between Odessa and Constantinople.

CANADA

A Canadian *Daily Record* telegram reports that the first 1,000 aeroplane engines which are being built in Toronto, have been completed and tested. The engines are being constructed at a plant worked by the Imperial Munitions Board.

FRANCE

The French official statement for April 1st, reports intense aerial activity and the destruction of enemy aeroplanes, as follows:

"On March 29-30 our aviators, despite rain and mist, carried out numerous sorties. Five thousand kilograms of explosives were dropped on enemy cantonments and stations in the region of St. Quentin, Guiscard and Roye. Our aeroplanes frequently attacked with machine gun and bombs enemy concentrations, which they dispersed. Nine German aeroplanes and one captive balloon were destroyed by our pilots.

"Italian bombing machines took an active part in these expeditions, and recently carried out with splendid audacity numerous raids on the enemy lines."

The War Office issued a statement on aerial activity on April 3rd, as follows:

"On March 31 and April 1 French aerial squadrons threw down 12,000 kilograms (more than thirteen tons) of projectiles on railways and cantonments at Ham, Chauny, Noyon, etc. A large fire was observed in the railway station at Onauines. German cantonments in the region of Roye were bombarded with many projectiles and attacked with machine guns from a low elevation. French pursuit planes were engaged in many fights, in the course of which eight German aeroplanes were brought down. Two others were put out of action."

The announcement of April 7th reports French aerial successes:

"On April 6 seven German aeroplanes and two captive balloons were brought down by our pilots. Our bombers dropped 5,000 kilos of projectiles on enemy stations and cantonments.

Enemy airmen unsuccessfully attempted an early morning bombardment of Paris on April 2nd. An official communication says:

"Two flotillas of German aeroplanes crossed the lines flying toward Paris early this morning. They did not penetrate the Paris barrage defense, but made a half turn, dropping bombs in the suburbs. There were no casualties."

The official reports of aerial activity during Germany's great effort to break the Allied lines are very brief, but an indication of the magnitude of these operations can be gleaned from a United Press dispatch, which states that an Allied squadron of eighty machines pursued a German squadron of forty.

In the recent German aerial attack on Paris, one of the enemy aviators dropped a bomb which struck and damaged the embassy building of one of the Central Powers.

Two days later the caretaker of the building requested the legation of the neutral power representing the enemy's country to present a bill to the French Government for the damages done to the building. France is asked to pay $900 for the destruction by the enemy of his own property.

Second Lieutenant Prince de Tonnay-Charente, one of the most promising young French aviators, is missing. He has brought down seven German machines.

GERMANY

Germany's aerial activity during the great offensive does not appear from the official announcements to be increasing in intensity. The official announcement of April 2nd, says:

"Twenty-two enemy aeroplanes and five captive balloons were brought down. Lieut. Kroll won his twenty-third aerial victory. By the energetic carrying out of long-distance observation from the coast as far as south of the Somme, aerial detachment No. 3, under Lieut. Friecke, rendered extraordinary service."

"Cavalry Captain Baron von Richthofen won his seventy-fifth aerial combat," says the German official announcement of April 3rd.

The War Office announced on April 7th that:

"In aerial battles eighteen enemy aeroplanes were shot down yesterday."

Dispatches to Les Nouvelles state that on the occasion of the last Allied air raid on Coblenz, twenty-six persons were killed and one hundred wounded. Great damage was done, the railroad station being demolished. In the last raid on Treves sixty were killed and hundreds were wounded, the railroad station was damaged and streets in the neighborhood were heaped with ruins.

In the raid last week the Cologne station was hit and many buildings were demolished. A troop train standing in the station was struck and many occupants were killed or wounded. The Emperor visited the spot the following day. A later dispatch from Geneva states that the recent British aerial raids on Cologne caused 248 deaths, half of whom were soldiers, according to the latest reports received at Basel. The soldiers were in a railway train bound for the Picardy front and standing at the Cologne station. Panic reigned in the city for twelve hours, the streets were deserted and the population hid in cellars. One report says that a Major was killed.

Emperor William was conferred upon Baron von Richthofen, the German aviator, the Order of the Red Eagle, with crown and swords.

GREAT BRITAIN

The British official statement for April 2nd reports aerial activity on the part of contact patrol and bombing squadrons, as follows:

"There was good visibility Monday and our low flying aeroplanes again were active. More than seventeen tons of bombs were dropped and thousands of rounds were fired from the air at the enemy's infantry and other targets on the ground. Hostile aircraft also were active on the southern portion of our front, some of their two-seated machines firing at our troops with machine guns from low heights.

"Ten hostile aeroplanes were destroyed and six others driven down out of control. Another aeroplane was brought down within our lines by infantry. Two hostile balloons were destroyed by our aeroplanes. Eleven of our machines are missing.

"After dark our night flying machines bombed enemy railway stations, billets, troops and transport, dropping many bombs on the Cambrai railway station, on the station southeast of Douai, on the railway lines south of that town, as well as on other targets. All of our machines returned."

The announcement issued April 3rd reports the following aerial activity:

"Hostile troops and transport on roads again were harassed Tuesday with bombs and machine gun fire. Over a thousand bombs were dropped during the day.

"The enemy's aeroplanes were fairly active between Albert and Moreuil. Thirteen German machines were brought down, eight were driven down out of control and three hostile balloons were destroyed. Seven of our machines are missing.

"At night rain fell continuously until 3 o'clock in the morning, after which time four and one-half tons of bombs were dropped on hostile billets and troops.

"Yesterday our aviators dropped seventeen tons of bombs and brought down sixteen German aeroplanes."

The official statement on aviation issued by the War Office April 4th says:

"Wednesday again was unfavorable for flying, but this did not prevent our aeroplanes from making several flights to reconnoiter the battle front and attack ground targets with bombs and machine guns. One fight occurred during a clear interval between two very large formations of our own and enemy machines. Otherwise hostile aircraft were not very active.

"Nine German machines were shot down, three were driven down out of control and one hostile balloon was destroyed. Five of our aeroplanes are missing."

The announcement of April 7th reports operations by large aerial units, as follows:

"About noon on Saturday our machines, watching the enemy's movements on the battlefront reported a concentration of hostile troops south of the Somme. Large formations of our aeroplanes issued immediately in the rain and dropped more than five hundred bombs on the enemy's assembled infantry, in addition to firing some 50,000 rounds at them with machine guns.

"In air fighting thirteen hostile machines were brought down and eleven others disabled. Two German machines also were shot down by anti-aircraft guns. Sixteen of our machines have not yet been located. Many of these undoubtedly made forced landings behind our lines, owing to the difficulty of finding their aerodromes in the heavy rain.

"Throughout the present battle the Canadian air force has done valuable work."

The British War office pays a high compliment to American airmen in the official statement issued April 3rd on aerial operations, which says:

"During the last fortnight of intense fighting in the air, the assistance rendered by the personnel of the American air service attached to the Royal air service has been invaluable."

A New York *Times* cable dispatch summarizes aerial activity during the great offensive, as follows:

"During the period from March 20-21 down to April 3-4, the British brought down at the front 240 German aeroplanes and drove down 123 out of control. During the same period the British had 122 machines missing.

"Excluding the bombs dropped in raids on Germany, British aircraft dropped during the same period 179¼ tons of bombs by day and 151 tons by night, a total of 300¼ tons. They also in the same period fired 1,139,525 rounds of ammunition from machine guns upon ground targets.

"When it is remembered that in order to fire upon ground targets the aeroplane has to take a special dive and in each dive fires only ten or twelve rounds perhaps, some idea can be formed of the enormous amount of work represented by these fighters. The maximum number of rounds fired at ground targets in a single day was 250,000, and in a single night 63,000. The maximum weight of bombs dropped during a single day was 31 tons, and in a single night 27¾ tons.

"In a single day one British brigade captured twenty-two German aeroplanes and drove down seven.

"Last month's long-distance bombing raids comprised thirteen British raids on German towns and only one German raid upon London."

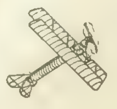
How necessary the rapid building of aeroplanes is, can be gathered from the official reports of losses on all battle fronts during February, as reported by Associated Press correspondence. These totalled 361, of which 268 fell on the western front, eighty-five in Italy, four in Palestine, three in Macedonia and one in Mesopotamia.

The Allies report that 273 German and Austrian machines were brought to earth by Entente airmen, while the German Headquarters claim to have brought down eighty-eight Allied machines on the various fronts.

Losses for December on the western and Italian fronts alone were 390.

ITALY

American aviators are engaged in signal work on the Austrian front (in Italy), according to a despatch to the *Intransigeant*, of Zurich.



MODEL NEWS

CLUBS

THE AERO SCIENCE CLUB OF AMERICA
98th St., 7th Ave., Brooklyn, N. Y.
PACIFIC NORTHWEST MODEL AERO CLUB
921 Ravenna Boulevard, Seattle, Wash.
CORRESPONDENCE MODEL AERO CLUB
Babylon, Long Island
BAY RIDGE MODEL CLUB
8730 Ridge Boulevard, Bay Ridge, Brooklyn
INDIANA UNIVERSITY AERO SCIENCE CLUB
Bloomington, Indiana
BROADWAY MODEL AERO CLUB
931 North Broadway, Baltimore, Md.
TRIANGLE MODEL AERO CLUB
Baltimore, Md.
NEBRASKA MODEL AERO CLUB
Lincoln, Nebraska
DENVER MODEL AERO CLUB
2820 Raleigh St., Denver, Colo.
BUFFALO AERO SCIENCE CLUB
c/o Christian Weyand, 48 Dodge St., Buffalo, N. Y.
THE ILLINOIS MODEL AERO CLUB
Room 130, Auditorium Hotel, Chicago, Ill.
TEXAS MODEL AERO CLUB
517 Navarro St., San Antonio, Texas
SCOUT MODEL AERO CLUB
304 Chamber of Commerce Bldg., Indianapolis, Indiana
MILWAUKEE MODEL AERO CLUB
455 Murray Ave., Milwaukee, Wis.
CONCORD MODEL AERO CLUB
c/o Edward P. Warner, Concord, Mass.
PLATTSBURG MODEL AERO CLUB
c/o James Regan, Jr., Plattsburg Barracks, Plattsburg, N. Y.
MODEL AERO CLUB OF OXFORD
Oxford, Pa.

LARGE scale models are rather uncommon among the average builders and we believe our readers will be interested in the six-foot scale model which is described by its constructor, Private Eugene J. McGuirk, Jr., a motor repair man in the Aviation Section, Signal Corps, U. S. Army. Mr. McGuirk's connection with the aviation division makes the model the more interesting, being so closely in touch with the full-sized aeroplanes of Uncle Sam's training stations. After being stationed at Kelly Field and Love Field Mr. McGuirk was transferred to the 196th Aero Squadron at Lake Charles, La.; from there he hopes to go "over the pond."

Specifications of the materials and construction of the McGuirk scout model are as follows:

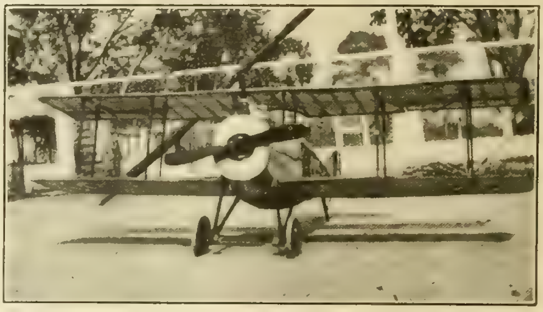
Fuselage constructed of 3/16" square longerons and distance pieces of the same material. The curved fuselage top (or "turtle back") is built of cypress formers upon which is laid 3/16" by 1/32" spruce battens.

In the forward portion the fuselage is covered with sheet aluminum and the rear part with linen, which is doped and varnished after the manner of the large aeroplanes.

The pilot's cockpit is upholstered with leather and provided with a miniature aluminum seat.

All the controls are made to operate the controlling surfaces in the usual manner. Deep control is used—a wheel connected to the ailerons, the control column operating the tail-flaps or elevators, and a foot-bar for the directional rudder. The ailerons are hinged on auxiliary wing beams 1½ inches to the rear of main wing beam. This allows a slot to be cut into the main wing for the operation of the control lever.

From tip to tip, the main wings measure 72". The chord is 12" and the gap 13". Wing spars and entering and trailing edges are of spruce. Ribs are of the block-and-batten type, built up of very thin strips of spruce which are spaced by means of small blocks to form the proper wing curve; four such blocks being used in each rib. Rib spacing 1½" apart.



E. J. McGuirk's 6-foot scale model Scout.

Covering is with silk which is given three coats of varnish.

Wiring between the planes is similar to that employed on the famous French "Spad"; the wires cross at the center struts. Strut fittings are cut from sheet aluminum and turnbuckles are made of bicycle spokes and nipples.

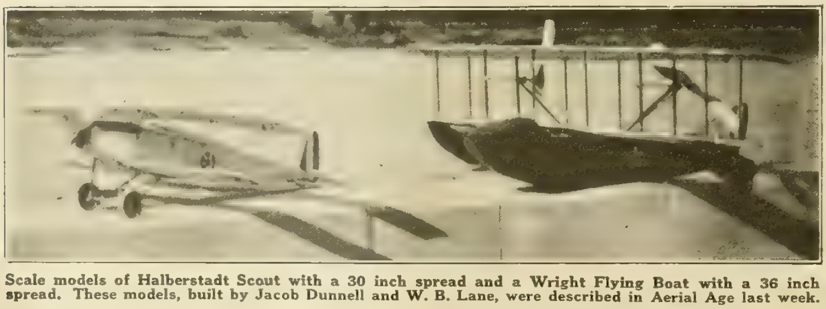
In the landing gear, each wheel is made of two cupped discs of aluminum which are held together by a copper-tube hub, the ends of which are riveted to hold the halves of the wheel together. The tires are made of raw gum rubber. The axle is bound to the chassis with elastic, for the shock absorbing effect.

At the forward end of the fuselage, a dummy six-cylinder motor is set so that the tops of the cylinders project through the cowling. The motor is carved from a block of wood, the cylinders painted black to resemble cast iron.

Correspondence Model Club News

Edwin A. Jenkins, Mem. Secretary of the Corrsependence Model Aero Club, wishes to make public the fact that the Club is now preparing a "Spring Drive" for new members. The example of this organization might well be followed by other model clubs in an effort to stimulate increased interest in the science. Progressiveness is evidenced in the Correspondence Model Aero Club's continued activity, and all interested are urged to participate with it in the good work.

A bulletin is published by the Club, which is supplied without charge to members. Those who write to the Secretary, Edwin A. Jenkins, 1141 Bushwick Ave., Brooklyn, N. Y., will receive a sample copy of the Club bulletin together with full particulars about membership.



Scale models of Halberstadt Scout with a 30 inch spread and a Wright Flying Boat with a 36 inch spread. These models, built by Jacob Dunnell and W. B. Lane, were described in Aerial Age last week.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Some Rules for the Guidance of Hull Draughtsmen and Boat Builders

To Draughtsmen.

In getting out drawings for use of the Boat Shop it is advisable to make full size drawings as it makes easier work for the man to walk about on them to have a look at what they are supposed to build.

When laying off lines on the floor it is as well to use a good lump of chalk off the beach, broken up into fairly small pieces, so that they get well scattered and trodden in.

It is suggested that as at present we have no proper floor, the laying off might be done on the beach on a good clear stretch of sand; the tides will probably wash it out, but our draughtsmen have not much to do and might manage to get through the work in a few months.

If in doubt about what you have shown on any tracing ask one of the Hull Inspectors or Air Board D.O. what it really is; they are certain to be able to solve these little problems, if they cannot they will let you know in a month or two, or drop the matter altogether.

To Boat Builders.

This trade is a very simple one, although people are foolish enough to serve an apprenticeship to qualify; anyone with a small kit of tools and no common sense can work at it and produce a complete flying boat hull in a few days. (See our paper patterns.)

If you have not done any work of this sort before, and you have to buy tools, it is advisable to purchase heavy hammers, spanners, and cold chisels, etc., the work is light, but heavy tools last longer.

Never drill holes for driving copper nails into hard wood, the nails will drive quite easily; only drill holes rather larger than the nails to be used in soft wood, they can then be pushed in with the thumb more easily.

"What dear little tires! How many miles do you get out of them?"

Rose burrs are only for decorative purposes, as long as they just hang on and are well driven into the wood they look all right.

The slots in screws are only meant for taking them out with; screws can always be driven in with a big hammer.

Planking joints need not be a good fit, as the two thicknesses of planking are only used to support the oiled calico in between.

Do not trouble to consult any drawings, these are only got out for the amusement of our Draughtsmen; it is as well to look occasionally at them as you would at a picture. it pleases the man who made them.

If you break a screw head off don't bother, glue in a dummy head so that it looks all right.

Put plenty of nails in planking, it does not matter if they are driven into anything else inside; they look nice and bright when the heads are filed off.

Colored putty and brown paper are good things.

Don't worry your Foreman or Charge Hand; they don't know any more about it than you do.

If you want any wood get it yourself. If it is cut into about six-inch lengths it is easy to split up for firewood.

When hulls are completed they should be sent to the Erecting Shop, where they will see that the varnish is well scratched up and the woodwork marked with heavily nailed boots. The fine finish is only put on the boats to keep the Boat Shop going.

Be accurate in your measurements in case the A. I. D. Inspectors level and plumb one of them up to see that one side is not more than three thirty-seconds of an inch wider than the other.

Always look out to be near the door when the whistle goes, the Canteen sprint gives you an appetite; it does not matter what time you start work again as long as you clock in.

In the Future

She: "Say, porter, how long is this dark cloud we're coming to?"

Porter: "If youse couple am jes' married, about long enough for one, but if you hab been in that state for some time, ah should say long enough for about foah jabs on the jaw."—*Gargoyle.*

Evident

She: "That scar on your head must be very annoying."

Aviator: "Oh, it's next to nothing."—*Columbia Jester.*

Making Certain

Kernel: Did you bury all the dead as I ordered this morning?

Privit: Yes, sir, but we had a little trouble with one of them.

Kernel: What?

Privit: Why, one of them raised up on his elbow and said he wasn't dead, but then he was one of them d—d Germans, and you never can believe anything they say, so we buried him anyway.—*Awgwan.*

Not Yet

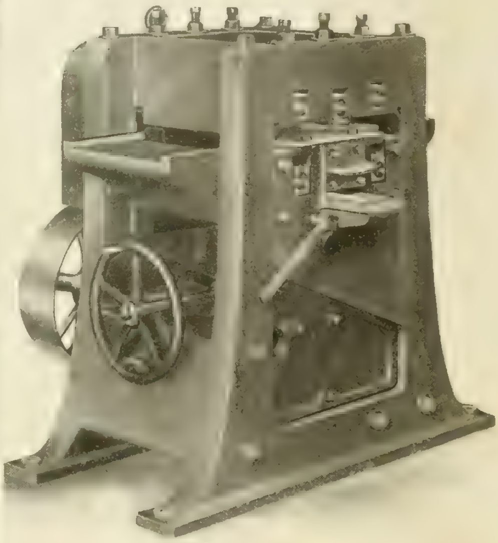
Alumnus of '78: "Who is that man over there with all the decorations? A French war hero?"

Fresh: "Naw, that's a guy that subscribed to the two Liberty loans, the Friendship Fund, the Army 'Y,' the Prison Camp Drive and the Red Cross Society."—*Gargoyle.*

Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a

WHITNEY
Toothing Machine



Whitney Scraping and Toothing Machine

If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

**Write for catalog
and samples of toothing**

Baxter D. Whitney & Son
WINCHENDON MASSACHUSETTS

S

Silver, Eugene W	SLR; CRI
Stevens, Wade	SLR; KST
Scott, Walter	SLR; KST
Speed, William George	SLR; KST
Shear, Coman Knight	SLR; TFT
Shackleton, Allan Doughtery	SLR; RSD
Sneckner, Leonard Anderson	SLR; KST
Smith, Kent Hale	SLR, CWT
Sturrock, Walter	SLR; CWT
Shaffer, William Luman	SLR; KST
Stoddard, David Izatt	SLR; RSD
Stocking, Miles Hausch	SLR; PMT
Slaughter, James Marshall	SLR; HHX
Skidmore, Andrew Allen	SLR; CWT
Sager, George W	CSO
Seifert, Frank W	FRF
Slocum, Winfield Scott	SLR, KST
Shirey, Walter Hampton	SLR; CWT
Snyder, John Abner	SLR; KST
Sweeley, Lester Julian	SLR; RWT
Steil, Fred H	FRF
Stewart, Robert S	FLR; AEF
Snodgress, David Little	SLR; KST
Smith, Landis S	CRI
Slaven, Lant Rader	SLR; KST
Scott, Alfred Clark	SLR, KST
Shields, Fred Milton	SLR; KST
Shoemaker, Louis Jack	SLR; KST
Spitzer, Ray Carlton	SLR; KST
Schulein, Benjamin Miller	SLR; KST
Stoddart, Herbert Allen	SLR; TFT
Sclotzhauer, Harry A., Jr	FLR; AEF
Stewart, Walter James	SLR; RWT
Sawyer, Herbert Smith	SLR; KST
Smith, Edson Bernard	SLR; KST
Smith, John Robert	SLR; DIK
Smith, Harry Glenn	SLR; CWT
Slater, Harry Edward	SLR; KST
Sutcliffe, Robert	SLR; PMT
Spencer, Eldridge T	FRF
Scott, Rufus Fenner, Jr	MAJ
Stevens, George	MAJ
Smith, Chandler	SBI
Shaffer, Oscar N	CWT
Stedman, Nathan Alexander	SLR; TFT
Smiley, David Binns	SLR; PFO
Stolze, Charles W	CAP
Schmidt, Victor	FLT
Stoddard, Marvin Homer	SLR; CWT
Smith, Westcott Timpson	SLR; CRI
Said, Mark	SLR
Sargent, Edmund B	SLR
Scales, George W	SLR
Scoville, Irving N	SLR
Searles, Harolde N	SLR
Sloss, Louis, Jr	SLR
Smith, Walter L G	SLR
Snodgrass, Maynard H	SLR
Snyder, Maynard H	SLR
Snyder, Don Vernon E	SLR
Snyder, Kenneth Mac G	SLR
Southwick, Philip O	SLR
Stein, Louis H	SLR
Stoddart, John C	SLR
Swift, Russell F	SLR
Sloane, John E	FLT
Soule, Horace	CAP
Schneider, Albert J	FLR
Schreiber, Ernest Frederick	SLR; CWT
Sultan, Thomas Preston	SLR; GLC
Scantlin, Thomas Edgar, Jr	SLR; GLC
Smith, Clarence B., Jr	PFO
Sloan, Samuel Addison	SLR; RSD
Smith, Paul Roscoe	SLR; KST
Sherman, Alza C	SLR; CWT
Spalding, Vaughan Clarke	SLR; KST
Stewart, Haven Charles Rex	SLR; KST
Southworth, William A	FLR
Stanley, Leonard L	FLR
Seydel, Fred	MAJ
Sweeney, Hart Temple	SLR; KST
Sullivan, John M	SGS
Scott, Curtis F	FLR
Smith, Lawton V	CAP
Smith, Fred H	FRF
Sturdivant, Edwin R	FRF
Stewart, Walter J	FRF
Sine, Byron Albert	FLR; CDT
Slade, Arthur J	CAP
Saxe, William V	FLR
Schadt, William F	SLR
Sanders, William C	SLR; DIK
Sherman, Alesea C	DIK
Steele, Cyrel H	DIK
Shaw, Robert Ross	CAP
Suggs, Henry Lee	FLR; PFO
Smith, Bruce E	FRF
Spake, Ralph E	FLR; AEF
Sulivan, Henry Bissell	SLR; RSD
Sweeley, Lester J	FRF
Scantlin, Thomas E., Jr	DIK
Sultan, Thomas P	DIK
Smith, Paulding	DIK
Sargent, Carl A	DIK
Schenck, Rollin N	FRF
Smith, Paul P	DIK
Smith, Walter J	FLR; AEF
Snyder, Floyd	DIK
Schreiber, Earnest F	DIK
Stoddard, Marvin	DIK
Small, Sydney F	Detroit, Mich. JRC; Note 1
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Slauson, Frederick C. T	FRF
Southworth, Gilbert S	FRF
Spencer, Frederick G	FRF
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Smith, Frank Arthur Cushing	SLR; CAF
Strong, James Henry Ward	SLR; CAF
Sutton, Harold Putnam	SLR; RSD
Schroeder, Frederick Amandus	SLR; KST
Sanders, James O'Hear	SLR; CWT
Sears, Louis Albert	SLR; DIK
Stees, Donald Bower	SLR; DIK
Steele, Cyril Hilding	SLR; CWT
Schlatter, Donald W	FRF
Smith, Wayne G	Note 9
Smith, Hugh L	FRF
Smith, Pauldin	SLR; CWT
Schweser, Elmore C	SLR
Seaman, Lewis F	SLR
Shaw, Donovan L	SLR
Sibbernsen, Albert H	SLR
Squiers, Bard MacD	SLR
Starring, David S	SLR
Snyder, Floyd	SLR; CWT
St. John, Alvin M	SLR; KST
Stokes, Charles Pickett	SLR; KST
Stanley, Walter S	FRF
Stauffacher, Earl M	FRF
Saunders, Minott F	FRF
Schaupp, John Martin, Jr	SLR; CWT
Stoddard, Walter A	SLR; KST
Seiler, Frederick E	FRF
Searle, Ralph O	FRF
Stevenson, Francis L	FRF
Simpson, John M	FRF
Tompkins, John L	FRF
Steele, John L., Jr	FRF
Sheffield, Frank H	FRF

T

Townsend, Edward I	SLR; DIK
Thomas, William C	FLR
Thomas, John	SGS
Thomas, Walter Grant	FLR; RWT
Tighe, George Raymond	SLR; TFT
Tonkin, Thomas Cecil	SLR; KST
Tatnall, Emmett R	SLR
Taylor, Nathaniel Landon	SLR
Taylor, William W	SLR
Taylor, Henry Bowman	SLR; SBI
Taylor, Harold L	PFO
Taylor, Edward Clark	SLR; CRI
Taylor, Ratcliffe	SLR; RSD
Taylor, Henry H	FRF
Tuttle, Waldo E	FLR
Thompson, Seth Waldo	SLR; SBI
Thompson, Roland Sanford	SLR; CWT
Thompson, Roland S	SLR; DIK
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Veach, Thomas Fudge	SLR; PMT
Vosburg, Murray Slawson	SLR; KST
Vautsmeier, Walter W.	MAJ
Vosburg, Roydon	SLR; KST
Van Vleck Lautz, Theodore	SLR; GLC
Vine, Francis J.	CAP
Vohr, John H.	FRF
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Vernon, Fred	DIK
Vancamp, Allen H.	SLR
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Venable, Edward Carrington	SLR; CSO
Vogelback, William Edward	SLR; ELA
Vickory, Merritt Arthur	SLR; CWT
Verhoff, Edward August	SLR; ELA
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Winter, Francis Jordan	SLR; ELA
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Whittemore, Harris, Jr.	SLR; KST
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Watson, Harold Samuel	SLR; DIK
Walker, Charles Lieberman	SLR; GLC
Welch, Charles Hosmer	SLR; KST
Walters, Harvey Henry	SLR; KST
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Warren, Kenneth C.	DIK
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Windle, Arthur Elmer	SLR; TFT
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Wadsworth, Jess B.	FLR; AEF
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Walker, Howe	SLR; CWT
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Woeltjen, Herman Henry	SLR; DIK
Warner, Charles Bolling	SLR; TFT
Wilke, Royal Golder	SLR; RSD
Wise, Harold Alfred	CPR; FOB
Wright, Fred Carothers	SLR; EOT
Winfree, Edward Shervin	SLR; TFT
Winkworth, Eugene H.	FRF
Wood, Myron Ray	SLR; KST
Wrenn, Robert D.	HHN
Walker, William Samuel	SLR; KST
Walker, Charles L.	SLR; DIK
Williams, Howard E.	FRF
Winston, James F.	AGC
Warner, Brady W.	CAP
Washington, George A.	CAP
Wilkes, Frank M.	CAP
Watson, Lester	CAP
White, George McDaniel	FLR; CDT
Wasson, Roy J.	FRF
Watt, Robert W.	FRF
Warner, William S.	SLR
Waste, James A.	SLR
Webster, Edward E.	SLR
Whitmire, John T.	SLR
Williams, Charles C.	SLR
Williams, Henry C.	SLR
Winship, Frank E.	SLR
Wadsworth, Paul E.	SLR
Wallace, James A.	SLR
Waner, Harry O.	SLR
Webster, Buel Lorman	SLR; EOT
Welch, James Wells	SLR; KST
Wallace, Edward S.	SLR
Wright, John R.	SLR
Wrinkle, John Stuart	SLR
Watson, Harold S.	FRF
Wilson, Gill R.	FLR
Wise, Bernard N.	FLR
Wright, Howard S.	FLR
Warner, Donald Ames	SLR; CWT
Witkinson, Henry Emile	SLR; HHN
White, Sanford Brownell	SLR; CAF
Weyant, Romer Gilpin	SLR; DIK
Willrich, Edgar Gebhard	SLR; KST
Woodleton, Royal B.	FRF
Witten, Laurence Claiborne	SLR; ELA
Wade, Herbert C.	FRF
Ward, Eugene B.	FRF
Walker, Paul A.	SLR
Wilson, Edmond H.	SLR
Walker, Robert M.	SLR
Wirth, George H.	SLR
Woodard, Jacob M.	FRF
Welch, Claire V.	SLR
Warren, Kenneth Carlton	SLR; CWT
Whitaker, Frederic Slack	SLR; CWT
Webster, Buel L.	FRF
Wherritt, Russell	SLR; CWT
Wiedmann, Duncan R.	FRF
White, George R.	FLR; CAF
Wright, Fred C.	FRF
Williams, Roy F.	FRF

Y

Yarborough, Robert Samuel	SLR; KST
Young, Samuel Harold	SLR; EOT; FRF
Young, Daniel Joseph	SLR; ELA
Young, George, Jr.	CAP
Young, Fred Matthew	SLR; TFT
Young, Ernest H.	DIK
Young, Wallace Scott	SLR; RWT
Youngreen, Charles C.	CAP
Yount, Paul Chaffee	SLR; TFT
Yeomans, James H.	KST

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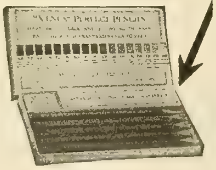

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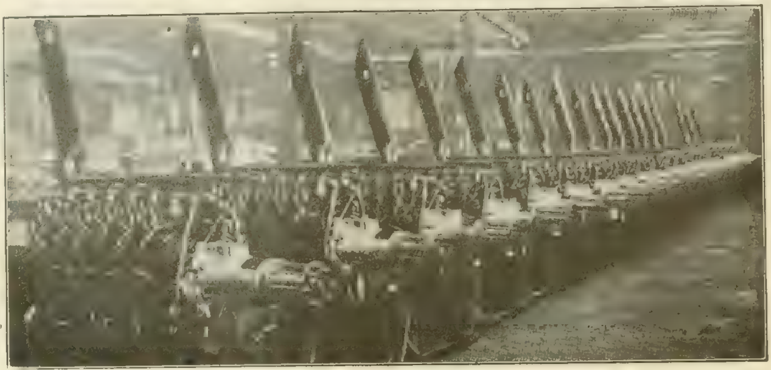

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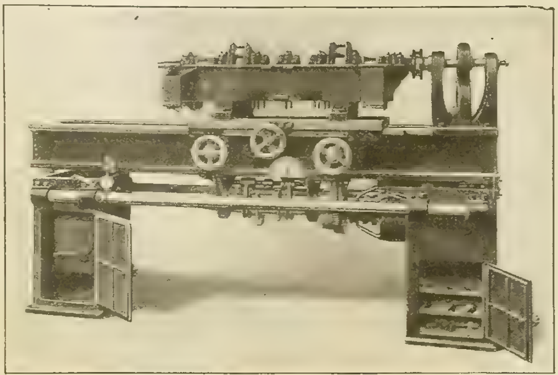

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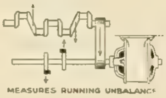

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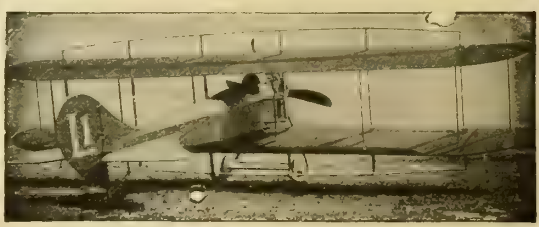

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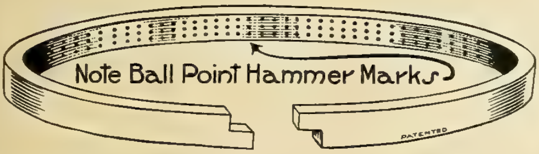
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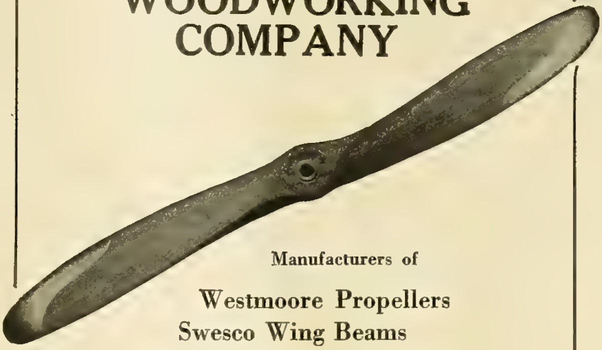

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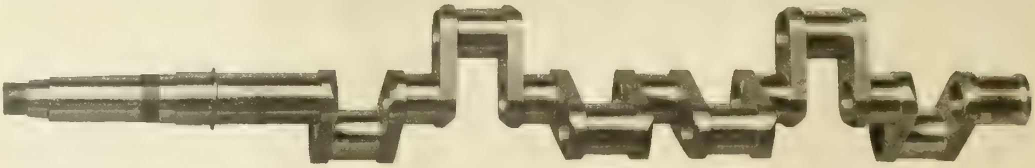

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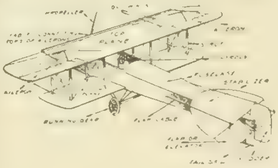

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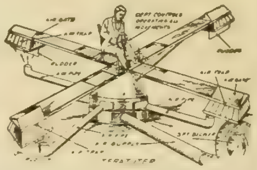

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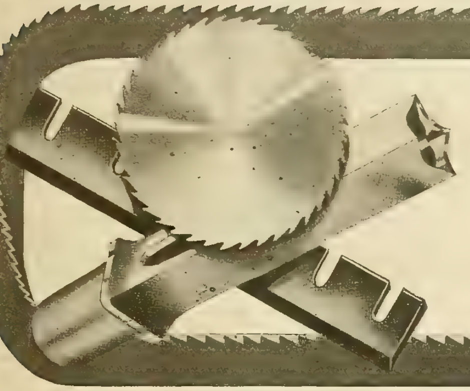

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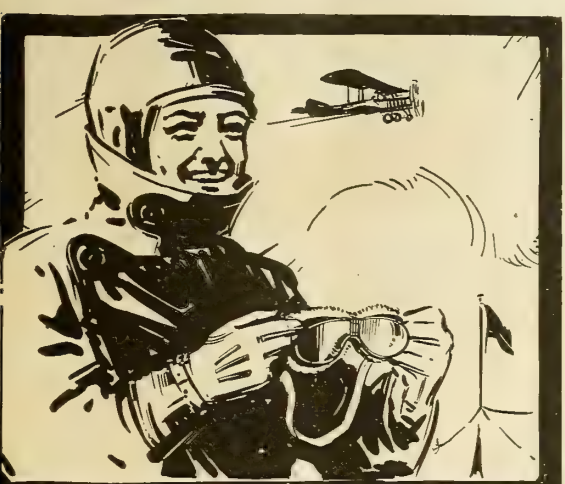

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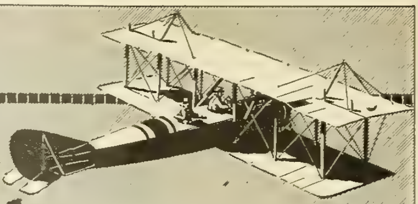

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AERIAL AGE
WEEKLY

Vol. 7, No. 13 JUNE 10, 1918 10 CENTS A COPY

Enlarged snap-shot of a three-motored Italian Caproni triplane in flight

War Carried to America by U-Boats

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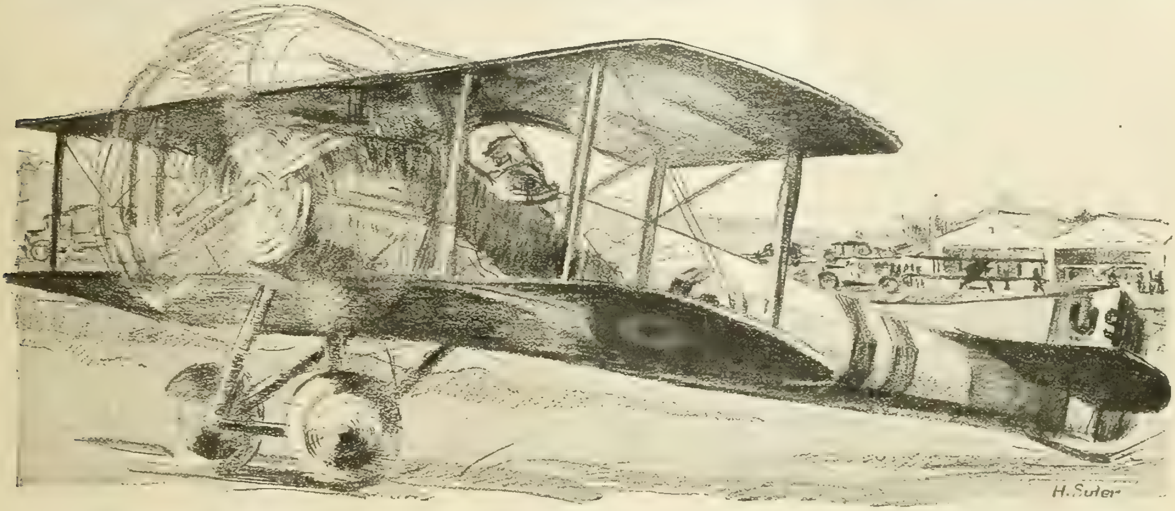

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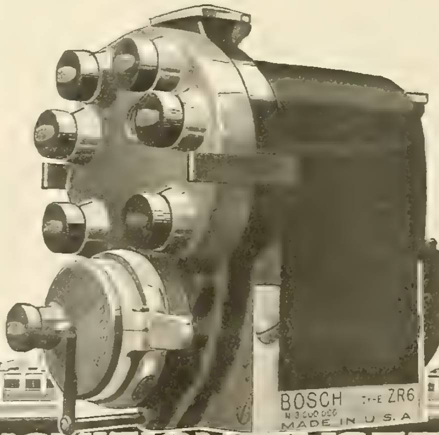

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HOW WE STOPPED THE LEAKS THAT KEPT US POOR

The Discovery Which Enabled Howard Lindsay and His Wife to Save One-Third of Their Income and Later Made Mr. Lindsay President of a Large Corporation. A Secret That Applies to Any Income

By Harrison Otis

WHO should walk into the room but Howard Lindsay! Of all men perhaps the last I had expected to find as the president of this great new company. They had told me that Mr. Lindsay, of the Consolidated, was looking for a fine country home and was interested in buying the Dollard Place in Englewood; so as executor of the Dollard estate, I had come to discuss the terms with him.

But Lindsay! Surely some miracle had happened. For it was the very man who had come to me "dead broke" about four years back and had asked me to help him get a new job. But how he had changed! The man I remembered was down at the heel, and timid and ill-kept. The man now facing me was keen-eyed, alert, confident and well groomed.

"You are surprised, Mr. Otis, I can see that without your telling me. I *was* a pretty sorry object the last time we met—and you may be sure I have not forgotten the good turn you did me when I needed it so badly.

"Let that real estate matter rest for a moment while I tell you how the miracle happened. It won't take five minutes. It all seems simple as A B C as I look back on it now. And come to think of it, it *was* simple and perfectly natural.

How It All Began

"My new life began when I discovered *how to save money*. That happened soon after I started in the new job you helped me secure. And it all came about right in my own home. Our family cash account was in terrible shape at that time. Both my wife and I had been used to luxuries at home and 'charge it to Dad' had been our easy way out of any money problem.

"But it was different now and our sole source of supply was my salary of $3,000. We never went to the theatre that we didn't have the uncomfortable feeling that we were using money that ought to go for coal or clothes or food. We seldom bought anything without feeling as though we were cheating ourselves out of something else.

"That year we didn't save one cent. Besides that, we woke up on New Year's day to find a big bunch of unpaid bills to be taken care of somehow or other out of future salary checks.

"When I asked myself the reason for all this I found that I did not *know* the reason, and no more did my wife, because we hadn't the faintest idea what our money had been spent for.

"Then I looked around among our friends and learned a great lesson.

"The Weeds, I knew, were getting more than $5,000 a year. They lived in a modest apartment, did not wear fine clothes, seldom went to the theatre, did little entertaining, yet we knew they barely had enough money to pay current bills. They found it out of the question to save any money and found themselves, so Weed told me, in the same predicament that we had faced on New Year's Day.

"In the case of the Wells I found a very different story and one that set me thinking hard. Their income was $2,000 a year, yet, to my amazement, they confided to us that they had saved $600 a year ever since they were married. They didn't have any grand opera in their program—except on their little Victrola—but they did go to the theatre regularly, they wore good clothes, entertained their friends at their home and were about the happiest and most contented couple of all our married friends.

Our Great Discovery

"Then I discovered the *magic secret*. The Weeds never knew whether they could afford to make a given expenditure or not. Theirs, like ours, was a sloppy, happy-go-lucky existence with the happiness cut out because they were always worried about money matters. They kept no accounts and just trusted to luck—and so had *bad* luck all the time.

"The Wells, on the other hand, were getting more real enjoyment out of life than people with double their income—simply because they *knew what they could afford to spend.*

"The difference between these two families was that in one case the expenditures were made without any plan—while in the other the income was regulated on a weekly Budget System.

"Right there I got my Big Idea and my key to success and happiness.

"We sat down that evening and made up a budget of *all* our expenses for the next fifty-two weeks. We discovered leaks galore. We found a hundred ways where little amounts could be saved.

"And in no time we were engaged in the most fascinating *game* either of us had ever played—the game of 'Money Saving.'

"In one short month we had a 'strangle hold' on our expenses and knew just where we were going. In one year my wife proudly produced a bank book showing a tidy savings account of $800.

My New Grip on Business

"In the meantime an extraordinary change had come over me in business because of my not having to worry about my personal affairs. I was able to give my employer's affairs my full, undivided attention during business hours instead of being harassed and worried as I had always been before.

"I didn't fully realize this until the president called me in one day and said, 'Lindsay, you have been doing exceptionally well. I have been studying your work for the last year and you have saved the company a lot of money. We have decided to give you an interest in the business.' And besides that he doubled my salary. I never told him what had worked the change, but my wife and I know well.

"When you consider what my income is now, all that I have told you seems funny, doesn't it? I can write my check in six figures today, and my new salary here is $25,000 a year. But I am still working on the same plan that I used to keep track of that original $3,000. Result, I know just what I can subscribe to Liberty Bonds and the Red Cross and all the other war funds, and I never have to wonder whether I can afford to have a new motor car, because my budget tells me—to a penny.

"It all began when we got a grip on our family expenses.

"So there you are. It is wonderful, isn't it? I often wish I might tell my story to the thousands of young married couples who are having the hardest time of their lives just when they ought to be having the best time.

"If you ever get a chance, do pass this message on, for there are thousands who don't know what the trouble is, who would give everything to know 'the secret of the fat bank balance.'"

So now I have the opportunity and you are lucky, if only you will act on the wonderful message this story contains.

HARRISON OTIS

* * *

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Skimping and scraping are banished and you save money as easily as you spend it.

Now you will not worry about the money you spend for clothes, food, rent or the theatre. You will spend it freely and will have the time of your life because you will *know how much you can afford to spend.*

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See how magically the Ferrin Book works, no matter how much or how little your income. We know what you will think of it when you see it. So we are willing to send you the book without your sending us any money in advance. Just mail the coupon, and back will come the book by return mail. When you have seen what big returns the Ferrin System will pay you, send us only $2. If you feel that you can afford *not* to have it, return the book and owe us nothing. Act now, for the sake of your bank account and your future.

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VOL. VII NEW YORK, JUNE 10, 1918 No. 13

WAR CARRIED TO AMERICA BY U-BOATS

THE war has been brought to America by the U-boats. Appearing before the Senate and House Naval Affairs Committees within a few minutes after the news of the operation of German submarines along the Atlantic Coast had been made public, Secretary Daniels, according to newspaper dispatches, said that the Navy Department had known of the presence of U-boats in American water since May 25. While not expressing the decided opinion that the military authorities had been expecting such an attack, he did say, however, that this Government was able to protect coastwise shipping, and in the future all transports would be convoyed the entire distance by destroyers. This policy, he said, had been decided upon as necessary after the sinking of the transport liner President Lincoln, when it became apparent that the German submarines were operating in wider areas than in the restricted war zone.

On June 3rd the U-boats began this drive. The reports, as we go to press, state that the following boats have been sunk:

Jacob H. Haskell, schooner, 1,362 tons, hailing from Boston, sailing for Norfolk; 11 in crew, no passengers.

Isabel B. Wiley, in ballast. Net tonnage, 611; crew, 8.

Hattie Dunn, of Rockland, Me.; net tonnage, 365; in ballast, sailing for Charleston.

Edward H. Cole, of Boston; tonnage, 1,395; in ballast, bound for Norfolk; crew, 11.

Herbert L. Pratt, steamship, oil tanker; sunk about five miles south of Overfalls Lightship, off the Delaware Capes. Thirty-eight on board; 37 of the crew rescued and landed at Lewes; one lost.

Carolina, passenger steamer, N. Y. & Porto Rico Line; net tonnage, 5,093. Passengers, 218; crew, 120. Total so far reported saved, 298; drowned at sea, 16; unreported and missing, 24.

It appears that the schooner Edna, which was found bottomside up several days ago and towed into Lewes, Del., was also a victim of the submarine. The crew of the Edna have been landed at New York. The master of the Winneconne picked up the crew of the Hattie Dunn.

According to published reports there are only five naval air stations on the Atlantic Coast. According to the published French and British reports it takes an air station at about every twenty miles to afford an adequate patrol against U-boats. As early as May 26, 1917, in a public session of the Chamber of Deputies, Admiral Lacaze, the French Minister of Marine, explaining the system of patrol against U-boats along the coast said in part: "We have organized seaplane posts all around the coasts so that the zone of action of each post joins that of its neighbor on either side."

The only extensive work on submarine hunting published is the chapter on the subject in Henry Woodhouse's "Textbook on Naval Aeronautics." This book gives the history of the employment of aircraft for hunting U-boats and the methods employed, and points out the absolute necessity of having plenty of seaplanes, dirigibles, and kite balloons for this purpose.

Thanks to the Aerial Coast Patrol Commission, of which Rear-Admiral Peary is the chairman, and to the efforts of the Aero Club of America, there were organized in 1915-1917 four aerial coast patrol units, the members of which were subsequently taken over by the Navy Department, and are now in the Naval Reserve Flying Corps.

The country will need every aviator who has had flying experience, and who may have applied for service and were told that they were not needed in the past. These men should apply again, sending their application to the Navy Department without delay.

The army air service proved of great help to the Navy in this emergency for the minute it became known that U-boats were operating along our coasts the Army aeroplanes at the Hazelhurst Field, Mineola, and elsewhere, were in service for aerial coast patrol work. They succeeded in rendering valuable assistance in locating boats loaded with men from the boats sunk by the U-boats.

Training Aviators to Hunt U-Boats Through Extension of Aero Mail

A committee from the Aero Club of America visited Washington on June 3rd to call on the Postal and military authorities to urge the extension of the aeroplane mail service to other cities east, west and south and thereby give hundreds of military aviation students their much needed training in cross-country flying.

Mr. Alan R. Hawley, president, and Mr. Henry Woodhouse, member of the Board of Governors of the Aero Club, told Second Assistant Postmaster Praeger that nothing that has been done by the War Department and the Post Office has met with such general approval as the giving of cross-country flying training to our military aviation students.

The big purpose of the aeroplane mail is the military value of training the military aviation students so they will be ready to lick the Germans not only on the western front but also right off our coasts hunting the U-boats which are beginning to sink our ships right near home.

To hunt U-boats, like conducting bombing operations against German bases and military formations, requires thorough familiarity in flying by compass under all conditions. To plot the position of U-boats or destroy a German base with bombs requires extensive experience in flying by compass by dead reckoning.

By extending the aeroplane mail service from New York to Boston and from New York and Washington to Chicago by way of Wheeling, West Virginia, and Lima, Ohio, and from Washington to Pittsburgh, Cleveland, Dayton and Detroit, and then from Detroit and Chicago to St. Louis, an extensive system of advance training can be evolved which will turn out aviators fit to take up bomb dropping duties upon their arrival at the western front.

Military authorities advised the Aero Club Committee that they have plenty of training aeroplanes and they are only too glad to co-operate with the Post Office in extending the aerial mail service so as to give advance training to military aviation students.

LARGE INCREASE IN AIRCRAFT PROGRAM NEEDED FOR REPLACEMENTS

THE fact that it takes a minimum of 40% replacements in aviators per month and 100% replacement in machines per month to keep our air forces in fighting condition is, at last, becoming generally known. The New York *Sun* for June 3rd printed the following dispatch from Washington:

> The published figures showing that 1,137 aeroplanes were downed in May on both sides in the fighting on all battle fronts, of which 750 were enemy planes, have ex-

cited much interest in military circles here as emphasizing the growing superiority of the Allies in the air and also of what may be expected when America really comes into the struggle in force.

But there is another feature that is not overlooked here, and that is the shortening life of the aeroplanes, now put at not more than one month. This has compelled a revision of all the early estimates regarding the number of machines necessary to give the superiority counted upon to blind the Germans and win the war.

Reports reaching here lately have been to the effect that Great Britain was now producing aeroplanes at the rate of 3,000 a month, while France had attained a production of 2,000. This would mean an annual production for these two countries of 60,000, or nearly three times as many planes as was called for in America's original aviation programme—22,000 machines. Instead of the 22,000 machines promised the first year only 5,076 have thus far been completed.

It is regarded as doubtful that this country can exceed the present rate of production in Great Britain before next year. There are some who believe that we will be doing well even then if we are able to maintain constantly at the front 2,500 machines. Figuring on the life of a plane being only one month this would require a production here of 30,000 machines a year. However, the addition of 2,500 machines to the 5,000, which according to reports here are now being maintained at the front by Great Britain and France would be a factor of tremendous importance in the military situation, according to army officers. Then, too, this rate of production is bound to be increased eventually.

A year ago 50,000 aeroplanes was talked about by some as sufficient to "blind the enemy." In view of the short life of the aeroplane it is now realized that this number is not as big as it looks, meaning only about 4,000 machines in the air constantly.

THE AIRCRAFT INVESTIGATIONS

THE sub-committee on aircraft of the Senate Military Affairs Committee decided on May 27 to go ahead with its inquiry into aircraft production. This decision came after Senator Thomas had told the sub-committee that Charles E. Hughes, special investigator for the Department of Justice, had stated that he was not opposed to an investigation by the Senate Committee so long as it did not interfere with his own investigation.

Senator Thomas quoted Mr. Hughes as saying that unquestionably the subcommittee had a field of inquiry before it in the failure of aircraft production, if it wished to go into that. He only urged that the committee keep clear of the criminal phase of the situation, if any actually existed, so he might go ahead unhampered. This the committee agreed to do.

The Senate committee will leave Washington toward the end of this week on a tour of aircraft factories throughout the country to get intimate data as to production. Later the committee will conduct hearings, some of which will be in secret and others in public.

"The sentiment of the subcommittee is that the people of the country want to be informed as to what has happened to prevent the manufacture of aeroplanes," said Senator Thomas. "The production, every one knows, has been startlingly small. The facts must come out. If we strike evidence that may better be handled by Mr. Hughes in his criminal investigation, it will be at once turned over to him. The Senate committee is not after any one's scalp. All we want to get is facts, so that the country may know."

May 28—Senate Investigation

Representative Kahn, ranking Republican member of the House Military Committee, said in the House debate on the Army Appropriation Bill, that aeroplanes and engines are being manufactured and sent abroad in large quantities.

Chairman Dent of the Military Committee said the Government had contracted to pay $850,000,000 for aeroplanes up to this time. This he itemized as follows:

For planes, propellers and parts, $186,000,000; for engines, $240,803,170; balloons, $9,390,240; machine guns, $28,496,921; clothing, $2,500,000, and general equipment, $32,000,000.

In the week ended April 27, he said, 110 training planes, 19 advanced training planes, 7 combat planes 214 primary training engines, 108 advanced training engines and 86 combat engines had been shipped abroad. There are now, he added, 3,439 aviators in the army, against seventy-three when war was declared, and 19,000 men training in this country and 5,477 training abroad.

Mr. Kahn said a number of young men offered commissions as First Lieutenants if they would train abroad received Second Lieutenancies, others coming into the service later having been put ahead of them. This was one of the mistakes he admitted had been made and should be corrected.

Mr. Kahn said much time had been lost on the air programme in trying to create an engine, and that production had been hindered by the action of co-belligerent nations. He denied reports that only one or two battle planes were in France, and added that the official reports of our men having brought down enemy planes were sufficient evidence that we had battle planes abroad.

One-third of $640,000,000 for aeroplanes, he concluded, was actually spent, while the balance and more has been contracted for.

Chairman Dent said the Military Committee had given the War Department substantially what it asked and had gone carefully into its expenditures, finding duplications in some instances. The delayed consideration of the bill, he added, was due to Secretary Baker's absence in France.

May 28—Hughes Investigation

The Senate Military Committee was asked by Charles E. Hughes, conducting the Department of Justice's aircraft investigation, for all information the committee has bearing on delays in the aircraft program. It will be turned over immediately.

Plans for co-ordinating the department investigation and that to be conducted by the Military Committee were discussed at a conference held by Chairman Chamberlain of the committee, Mr. Hughes, and Attorney General Gregory.

May 29—Senate Investigation

The Senate Committee's aircraft investigation was commenced. Witnesses were Colonel W. C. Edgar, in charge of the construction division, and his assistant, Lieutenant-Colonel E. Lester Jones. Their testimony was given in secret.

Committee members announced, according to press reports, they were satisfied with the statements of the witnesses, and that while the expenditures had been above normal, they were not exorbitant in view of extraordinary conditions under which construction work was carried on.

May 31—Hughes Investigation

Officers of the Signal Corps in charge of awarding contracts for aeroplanes were called before Charles E. Hughes, in charge of the Department of Justice's investigation into aero production, and questioned. Attorney General Gregory and Mr. Frierson, Assistant Attorney General, participated in the examination.

Mr. Hughes explained that much of his work hereafter will be the questioning of witnesses to supplement information obtained from War Department and Aircraft Board records. The identities of the witnesses will not be made known, but it is understood several prominent men connected with the air programme are to be called within a few weeks.

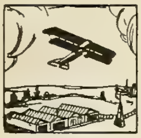
Senate Investigation

The aircraft production subcommittee of the Senate Military Committee plans a "surprise" visitation upon some of the aircraft plants of the country. The five Senators will slip quietly out of Washington, to appear at the least to be expected point of their proposed itinerary and delve straightway into the work of investigating at first hand.

Evidence of extravagance, negligence and sloth is the sort of data which the subcommittee members have started out to find. It was tacitly admitted at the Capitol that the first point of scrutiny would be in the middle West at one or another of the plants where Liberty motors are being assembled. After its investigation of machine shop and assembling plants for the engine the subcommittee will visit those points where aeroplanes are being assembled and where frames, bodies and wings are being constructed.

It is not the intention of the subcommittee to hold hearings while away from the capital. Of course questions formal and informal are bound to be asked, and if the situation demands it the subcommittee has its right to administer oaths and take testimony right on the ground, should such a course seem necessary.

One of the principal reasons for the studied avoidance of investigation under oath without every necessary concommitant of a regular investigation will be the desire on the part of the committee to give no "immunity baths" or to permit no aircraft contractor or engineer to commit himself to a statement which might interfere with the investigation undertaken by Charles E. Hughes.



THE NEWS OF THE WEEK

Aero Mail Service Pleases Burleson

Washington, May 28.—With the arrival of the aeroplane mail in New York at 2.30 P. M. the first two weeks' service operated by the army for the Post Office Department between Washington, Philadelphia and New York has been completed to the satisfaction of the postal authorities.

According to an announcement, out of the twelve trips eight were completed before 3 o'clock in the afternoon and two before 3.50 P. M.; one trip was completed at 2.25 P. M. and two at 2.34 P. M. There were two delays, when the mail reached New York at 4.45 P. M.

The aeroplane mail from the north arrived in Washington six times before 3.30 P. M., twice between 3.30 and 4 P. M., and four times after 4 P. M.

All letters got special delivery service promptly on arrival at point of destination. "The success obtained in operating the aeroplane mail service," said Postmaster General Burleson, "exceeds what I expected of the new route during its initial stages. The army has rendered a splendid service, which is not only a distinct contribution to the commercial world but is proving valuable training for the aviators who are about to enter upon a greater task in France."

Bevione Appointed Italian Commissioner for Aeronautics in America

Rome, Italy.—Giuseppe Bevione, member of the Chamber of Deputies, has been appointed Italian Commissioner for Aeronautics in America, according to news dispatches from Rome. He is editor of the *Turin Stampa*.

W. C. Potter Appointed Assistant Director of Aircraft Production

Washington, D. C.—W. C. Potter has been officially appointed assistant director of aircraft production by Mr. John D. Ryan, according to an announcement recently made public.

Government Leases Testing Field

Detroit, Mich.—A tract of ground one-half mile square, located near the Lincoln Motor Co. and the Fisher Body Corp. plants, has been leased by the government for testing aeroplanes. The land was offered to the government without charge but it insisted on paying for it.

Browning Aeroplane Gun Gives Satisfaction

Washington, D. C.—Announcement was made by the War Department that the Browning Machine gun had successfully undergone a test to determine its value for use with aircraft. The statement is made that the gun functioned perfectly and that the model of the weapon to be used with aircraft will be the heavy type with the outer jacked removed.

The gun used fires through the propeller and is controlled by a hydraulic or mechanical device, and impulses from the crankshaft are transmitted to the machine gun.

In the recent tests, the gun was mounted on the frame of an American combat plane and connected with the aeroplane engine. The test was conducted on the ground and in place of the propeller a metal disc was attached to the crankshaft. The Browning gun was then required to register hits on the metal disc as it revolved at varying speeds from 600 to 2,000 revolutions per minute. The slightest "hang fire" or delay in action on the part of the gun bullets to hit precisely on the spot on the disc representing the centre of the zone of fire. The gun functioned perfectly.

The United States will also employ the Marlin aircraft gun, which is also a synchronized weapon. The Lewis gun is used on aircraft, but only in two seater machines. The French and British use the Vickers synchronous gun.

New York City Darkened As Air Raid Precaution

The New York City police authorities, appreciating the necessity of being ready for any emergency in connection with the presence of the German U-Boat raiders off the Atlantic coast, on June 4th issued the following order:

"All commanding officers of the Police Department:

"All display lights, advertising signs, or special illumination throughout the city, including the seashores, will be discontinued until further orders. This will not include city lights.

"In office buildings and dwelling houses where lights are used, shades will be drawn where it is possible to do so.

'Notify all concerns immediately."

The interests concerned in the city promptly obeyed the police instructions.

Seaplanes Fly to Havana and Return

Havana, May 31st.—Three American hydroaeroplanes flew from an American naval aviation training centre to Havana, Cuba, in a practice flight. The flights were made without mishap or incident. On the following day, June 1st, two of the three machines returned safely, but one machine, before getting away was damaged by bumping against a barge, but was repaired and left under its own power.

The third hydroaeroplane is being returned on board a steamship. It was damaged by falling just after it had started to leave the water. After striking the surface it turned over on its right side. Pilot Douglas jumped, but his mechanician fell with the machine. Both escaped injury. The motor was not damaged, but other parts were broken.

Aerial Navigation Courses Given At Camp Dick

Washington, June 2nd.—The War Department announced the completion of special courses in compass adjustment and air navigation by commissioned officers in the American air service.

The Department of Military Aeronautics recently organized a school at Camp Dick, Dallas, Tex., where the two courses were conducted with British officers as instructors.

Captains S. T. Fripp, Royal Air Forces, taught the compass class. This course was designed to give engineer officers special instruction in the adjustment and compensation of aeroplane compasses, which get out of order because of the local magnetic fields set up by magnetos and engines and the jarring due to rough landings.

The course in navigation was conducted by Naval Instructor W. T. Farr, R. A. F. It consisted of instruction in air navigation or flying by dead reckoning, a method followed when the ground is not in view.

Each of the air service flying schools in this country was represented in this course by an officer who had charge of cross country flying. The officers who finished this training will now return to their respective flying fields to instruct cadets in this subject.

Summer Meeting of S. A. E. Will be Well Attended

Dayton, O. — Reservations for the Orville Wright dinner at the Dayton meeting of the would have been shown by the failure of the Society of Automotive Engineers are well over the seven hundred mark, to be held June 17th and 18th. The Standards Committee meeting and sections conference will take place on June 16th at the Dayton Engineers Club. President Kettering will act as toastmaster at the dinner. Governor Cox, of Ohio, has promised to make an address, and other speakers will be on hand.

On June 17th W. B. Stout, technical advisor of the Aircraft Board, will discuss present day problems in aeronautics. Fay B. Faurote, of the Curtiss Aeroplane and Motor Company, will talk on "Aeroplanes of Today," and F. W. Caldwell, aeronautics engineer of the Aviation Section of the U. S. Army, will give a paper on propeller design. The subject of the design of exhaust mufflers for aeronautic engines will be discussed in a paper by Archibald Black.

Reports on the International Aircraft Standards Conference, which was held recently in London, will be presented by C. M. Manly, chairman of the Aeronautic Division of the S.A.E. Standards Committee; E. H. Ehrman, chairman of the Miscellaneous Division of the S.A.E. Standards Committee, and by S.A.E. General Manager Coker F. Clarkson, who attended it on behalf of the Society, and have recently returned to this country.

A paper on "Processes of Petroleum Refining" is to be presented by C. W. Stratford, a nationally known petroleum technologist. A symposium on heavy fuel engines for automotive purposes will be participated in by P. L. Scott and C. E. Sargent, automotive engineers, who have been working on some entirely new developments in the heavy oil field.

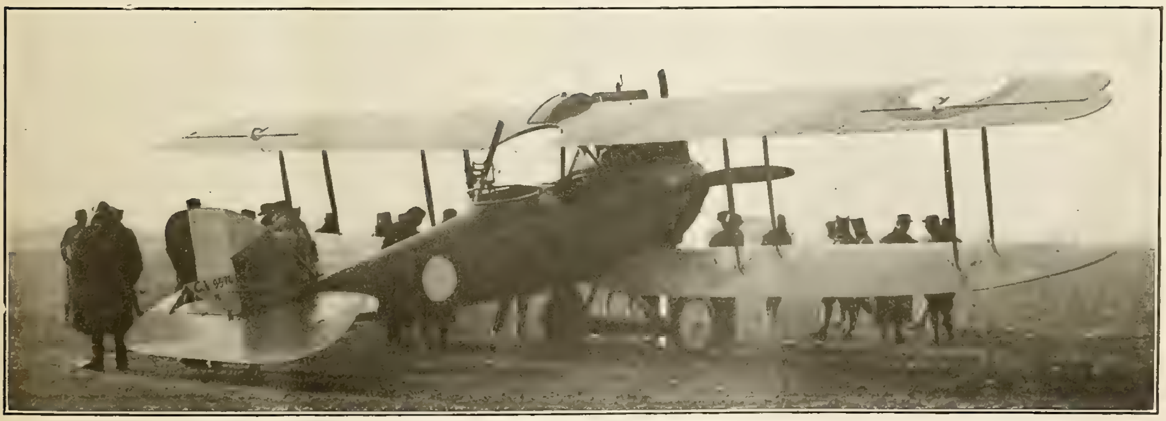
A report will be presented by the Standards Committee on the work done since last January, which has been working on the standardization of details for the Government aircraft and shipbuilding programs, specifications for tractor elements, as well as on a large number of other subjects closely connected with the design of war automotive apparatus.

Formation and night flying will be conducted by machines from the aviation fields near Dayton. It is also hoped to have on exhibition a captive balloon, of the type used for artillery direction in Europe.

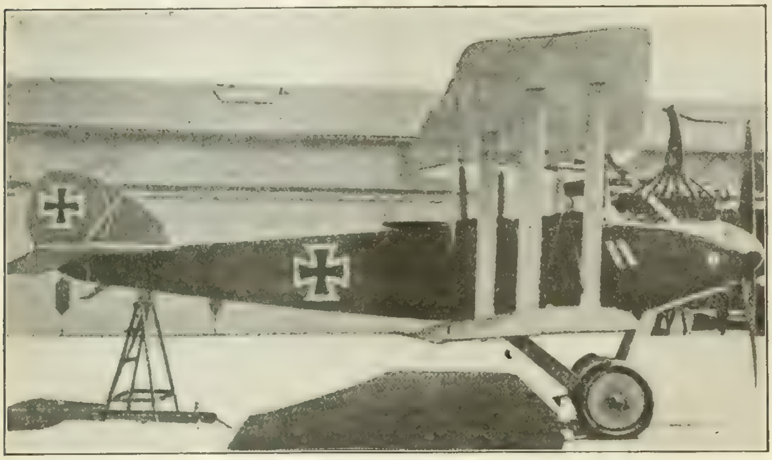
The general arrangements for the meeting are under the supervision of the Meetings Committee of the Society, consisting of David Beecroft, chairman; Herbert Chase, Fred E. Moskovics, F. E. Place and C. F. Scott. Mr. Chase is handling the securing of papers; Mr. Place the general arrangements; Mr. Scott the dinner details, and Mr. Moskovics, vice-president of Nordyke & Marmon, will supervise the reception of guests.

O. H. Fisher Addresses Automotive Engineers

Chicago, Ill.—The Mid-West Section of the Society of Automotive Engineers held its first joint meeting at Hotel Sherman on June 4th. This meeting is the first since the S.A.E. took over the technical work of the National Gas Engine Association. Following the meeting, George W. Smith, chairman of the Mid-West Section of the S.A.E., and assistant chief engineer Nash Motors Company, Kenosha, Wisconsin, presided. O. H. Fisher, president of the National Gas Engine Association, and president of the Union Gas Engine Company, Oakland, California, was one of the speakers.



An interesting German machine captured by the French and subsequently used for training. (French Official Photo)



Side view of the German A. G. O. Biplane, with its characteristic interplane strut construction

At the Army Aviation Schools

Tests conducted at Fort Sam Houston, Tex., of carrier pigeons used in co-operation with aeroplanes made recently by the Signal Corps proved a success. It has developed that pigeons can be released with a message while the aeroplane is in flight. The bird is thrown by the pilot so as to clear the machine and the immediate current of air going with it. The birds then drop until they reach the proper height for easy natural flight, when they circle about just as they do after rising when released on the ground, and start back to the loft. Pigeons used by the Government carry either a band marked "U. S. A." and a serial number, or have "U. S. Army" stamped on the wing feathers. Persons finding any such pigeons either killed, injured or penned are urged by Lieutenant Reges to notify the Department Signal Office, Fort Sam Houston, Tex., immediately.

An army dirigible, on a practice flight above the waters of Great South Bay, near New York, became stuck in the mud of a small island recently, when compelled to descend because of a sudden cloudburst and electrical storm. The harder the pilot worked, the tighter the mud took hold of the dirigible, so he gave up in despair, curled under his leather cushion and went to sleep. The next morning he arose, walked down the beach until he arrived at a coast guard station and reported his predicament. Soon afterwards, the balloon was being towed home by a patrol party.

Soldier athletes of the Aviation Corps, U.S.A., Field No. 2, at Mineola, excelled last week in the track and field meet held for the soldiers on the improvised track at Field 2 under the auspices of the New York A. C. The meet was a triangular contest between the student fliers of Fields 1 and 2 and the soldiers of Camp Mills, but the latter failed to gain a place in any of the events held, making the meet really a dual competition between the two aviation fields.

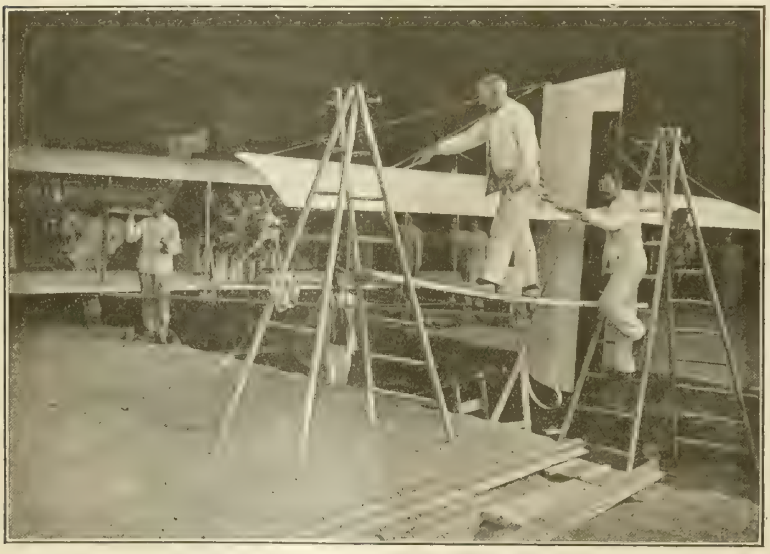
New York to Boston Aerial Mail Service Inaugurated

New York, June 3rd.—Within a few weeks after the successful inauguration of the New York to Washington Aerial Mail Service, the Post Office Department is extending the route from New York to Boston.

Lieutenant Vanel will take to the air from Army Aviation Field 1 at Mineola as early as possible this morning, so that he will have ample time to return to New York or continue his flight to Montreal. His mail packets, containing about 4,000 letters, among them messages from Postmaster General Burleson and French officials in Washington to public officials in Boston, were taken to the hangar at the field yesterday afternoon and put under guard there. He will fly in an American-built machine not equipped with a Liberty motor.

New Supervisor of Aerial Mail

Washington, June 1st.—Captain C. A. Weidenbath, of the Signal Corps, United States army, who has seen three months' service as a flier with the American forces in France, has been appointed by the War Department as supervisor of the Aeroplane Mail Service between Washington and New York, it was announced to-day. He will succeed Major Reuben H. Fleet, who has been transferred to a California flying school.



Giving the last coat of varnish to a machine in a French aircraft factory. (French Official Photo)

Aircraft Production Figures Revealed in Discussion of Army Appropriation

Washington, D. C.—Facts communicated to the Military Committee by officers of the Signal Corps and made public on May 29th, in the consideration of the $12,000,000,000 army bill, makes it possible to summarize the production of aeroplanes, their shipment abroad, and the number of aviators trained and sent abroad. The figures show that of the 22,000 aeroplanes called for in the original program adopted almost a year ago, there have been completed and put into service 5,076 machines. Of this number, 3,760 have been made and assembled in this country, and are in use here, a large proportion of them being training planes. The rest are of foreign manufacture, built largely with American materials, and in use with General Pershing's army. There are 323 combat planes among the 1,316 machines in France.

Deliveries of the Liberty engines up to date are:

For the army, 561; to the navy, 480. Total delivered, 1,041; to foreign governments, 900. A total of 3,000 Liberty motors have been ordered by Great Britain. Average price of planes, $5,000. Price of Liberty engines, $1,950 to $5,000. Total cost of planes and engines, from $6,900 to $10,000.

Life of aeroplanes in continuous service, one month.

Rate of deliveries in last week of April was: For planes, 110 primary training planes, 19 advanced training planes, 7 combat planes.

For Liberty engines, 241 primary training engines, 108 advanced training engines, 86 combat engines.

This rate of production is slowly but steadily increasing.

The total expenditures and obligations made in connection with the aviation service is now $859,839,000.

There are to-day in the armies of the United States 6,211 flying officers and 8,364 non-flying officers. Of the flying officers there were on May 1st, 1,509 abroad and 4,606 in this country. Of the non-fliers 1,854 were abroad and 6,506 in this country.

For the 1,509 fliers abroad there are 1,316 machines, or less than one machine per man, compared with a requirement, according to latest revised calculations, of six machines per man, or a total for 1,509 fliers of 9,054 machines.

There are 2,983 cadets at the flying schools in this country and 2,044 abroad, a total of 5,937.

Statements made to the House committee show that for the past three weeks a considerable number of aeroplanes have been shipped on practically every vessel leaving this country, so that the ratio between the number of fliers and machines is rapidly being overcome.

Navy Aviation Section Wants Men

New York City.—Truman E. Newberry, assistant to the commandant of the Third Naval district, issued a special appeal for the enlistment of trained men at once in large numbers for the aviation section of the United States Naval Reserve Force. Special ratings will be given men who enlist. The age limits are from 18 to 35 years. Men within the draft age can obtain permission to enlist. General machinists, automobile mechanics and assemblers, tool makers, die makers, cutters and cloth fitters, upholsterers, canvas workers, painters, tent riggers, wood workers of all kinds, toolsmiths, forge men, furnace men, coppersmith, shipfitters and all kinds of sheet metal workers are wanted. Applications for enlistment are being received at 51 Chambers street and at all navy recruiting stations.

Predicts Five-Cent Aero Mail Service

Baltimore, Md. May 27.—Second Assistant Postmaster General Praeger in a statement to a staff correspondent of *The Baltimore American and Star* predicted the following developments for the aerial mail service:

Five-cent mail service by aeroplane.

Flights between Chicago and other Middle West cities and Eastern points, and, finally, transcontinental flights.

Washington to Chicago flights in from seven to nine hours.

Establishment of flights in sections not accessible by trains.

Aerial routes where circuitous approaches, due to cañons, lakes, and other natural objects, make ordinary mail deliveries unusually slow.

Final interlocking of the entire country after the war with aeroplane mail service for letters and packages.

"We are training aviators now," he said, "with the intention of using them for the aeroplane mail service when they return from aviation work in France. By that time we believe that the service will be developed to such an extent that both men and machines will be needed for the work in every part of the United States.

"At present, it seems, the service is somewhat handicapped by being forced to use only one-engine machines."

For this reason, Mr. Praeger said, its real development could scarcely be carried out until after the war, when both aviators and three engine aeroplanes would be available. Mr. Praeger was not favorably inclined to women aviators for postal aerial work.

AMERICAN AIRMEN ON FOREIGN SERVICE

"In the course of air combats this morning our aviators shot down a hostile machine," says General Pershing's official communication of May 27th.

Lieutenant Paul F. Baer, of Mobile Ala., was posted as missing since May 22nd. Lieutenant Baer is a member of the American Flying Corps and formerly belonged to the famous Lafayette Squadron. He is one of the most brilliant American aviators and is an ace. He was cited by the French early this month, after bringing down his fifth German machine.

The news that American aeroplanes are flying in France has caused great jubilation in Paris. Dispatches from the front refer in the highest terms to Germany's new enemies in the skies, and official assurances that America has a large number of well trained airmen to throw into the struggle when a sufficient supply of machines arrives in the battle zone has created profound satisfaction.

A number of American aeroplanes late in the afternoon assisted the French infantry in fighting near Pont-au-Mousson. Swooping down over the German lines, the Americans poured an avalanche of bullets into the enemy's trenches.

May 28th

The official American communique for May 28th reports aerials operations, as well as the first extended infantry attack of our troops, in the capture of Cantigny. The text of the statement on aeronautics follows:

"Section A—Early in the day our aviators shot down a hostile machine.

"Section B.—Yesterday morning three of our planes encountered four hostile planes flying at 3,000 meters in the region of Montsec. In the fighting which ensued Lieutenant Douglas Campbell successfully attacked two of the German machines. Of these, one lost both wings and fell. This was referred to in yesterday's communique. In the same encounter one of our aviators was wounded, but succeeded in making a normal landing within our lines.

"This morning Lieutenant Rickenbacher and Lieutenant Campbell attacked a group of six enemy planes and brought one down out of control."

Lieutenant Edward V. Rickenbacher of Columbus, Ohio, and Lieutenant Douglas Campbell of California this morning forced a German biplane down out of control in the Bois de Rate, northeast of Xivray, in the Toul sector. They fought six enemy planes. The German machines encircled the American pilots and attempted to drive them behind the German lines. Rickenbacher suddenly pounced on one of the enemy planes, and Campbell, going to his assistance, managed to drive the enemy down.

May 29th

General Pershing's official communique of May 29th reports aerial successes. Section A of the report states that "it is established that on May 27th our aviators shot down two hostile machines instead of one as reported."

Section B of the statement reports the following activity:

"In the late afternoon of May 27th Lieutenants Fisher, Curtis, Buford, McLanahan, flying at 4,000 meters on patrol duty, encountered hostile planes in the region of St. Mihiel. In the fighting which ensued one of the hostile planes broke into flames and fell.

"Credit for bringing down aeroplane reported in yesterday's communique is given to Lieutenant Rickenbacher and Lieutenant Hambleton and not to Lieutenant Rickenbacher and Lieutenant Campbell as reported.

"This morning an English aviator returning from bombing expedition was wounded in the arm. He was chased by two enemy machines.

"Lieutenant Campbell drove the hostile aeroplanes off, enabling the English aviator to return to his aerodrome safely."

May 30th

The official journal of the French republic prints several citations of volunteer aviators from the United States. The fourth and fifth victories of Major William Thaw of Pittsburgh are announced as follows:

"Thaw, commander of the Lafayette Squadron, is absolutely remarkable as squadron chief, giving his pilots the finest example of courage and enthusiasm, making his squadron a unit of

(*Continued on page* 650)

The Balloon Division of the Goodyear Tire and Rubber Company recently had their summer outing. The above illustrations depict some of the activities. (1) The employees of the Balloon Division. (2) Entraining for the field. (3) Jumping the rope., (4) Watching a dirigible flight. (5) The girls' race. (6) Putting the dirigible in the hangar after the flight. (7) Helen Ratzon, Mary Cessna and Bertha Sheets, winners of the girls' race.

The AIRCRAFT TRADE REVIEW

N. E. J.

Curtiss Company Elects Officers

Buffalo, N. Y.—At the annual meeting of the Curtiss Aeroplane & Motors Corporation held here recently, the following officers and directors were elected:

Glenn H. Curtiss, chairman of the board of directors; John N. Willys, president; James E. Kepperley, vice-president and general manager; C. M. Keys, vice president; E. C. Morse, vice-president, W. W. Moss, vice-president and comptroller; B. A. Guy, secretary and assistant general manager; J. F. Prince, treasurer; H. M. Root, assistant comptroller; J. J. Donahue, assistant treasurer; J. F. Weber, assistant secretary.

The board of directors consists of Glenn H. Curtiss, C. H. Conners, Harry Evers, B. A. Guy, C. M. Keys, James E. Kepperley, W. A. Morgan, W. W. Moss, F. R. Russell, J. Allan Smith, G. C. Taylor, J. N. Willys, Rodman Wanamaker, W. B. Stratton and J. A. D. McCurdy.

American Truck & Aeroplane Co. Buys Factory

Kankakee, Ill.—The American Truck & Aeroplane Co. has bought the plant of the Unifile Co. at Riverview, Ill., and will equip it for the manufacture of commercial vehicles and aeroplanes.

Curtiss Production Figures

Buffalo, N. Y.—In the 12 months ending April 1, 1918, the Curtiss Aeroplane & Motors Corporation manufactured and delivered 2,209 aeroplanes, according to figures published in *Automotive Industries*. In addition, the company built and delivered, 2,205 OX engines, and 389 V2 aeroplane engines, during 1917. Of the 2,209 planes, 1,376 were of the preliminary training type and 339 were for advanced training. In the total number, 31 models were included. Two types of seaplanes are being made for the government, one equipped with a single, the other with a double engine

Goodrich Sales to Total $100,000,000

Akron, O.—According to a recent estimate, the gross sales of the B. F. Goodrich Co. will total $100,000,000 during 1918, as compared with $87,155,072 in 1917, and $55,416,866 in 1916. In the 1917 manufacturing ratio of 17.4 per cent is maintained, the company will earn between 16 and 18 per cent on the $60,000,000 common stock.

Curtiss Men Plan Club

Buffalo, N. Y.—Plant managers, superintendents of departments and formen of the several factories of the Curtiss Aeroplane & Motors Corporation located on North Elmwood, Elmwood, Niagara, Churchill, Austin and Bradley Street factories of the company have started a club for members of the organization. Erie Beach and its grounds will be leased for the summer and exclusive use of the beach, hotel, tennis courts, baseball diamond, athletic field, dance hall and other equipment will be given to the club members. After October 1st, it is planned to open a town clubhouse. The club will be maintained, officered and managed by Curtiss employees.

Changes in Curtiss Personnel

Buffalo, N. Y.—Changes in the personnel of the factory organization of the Curtiss Aeroplane & Motors Corporation have been announced as follows:

M. O'Shaughnessy has been appointed superintendent of Division B, boat final assembly, at Factory J, succeeding J. M. Lydiatt, resigned.

J. R. Hansen has been made superintendent of assembly division No. 1 of the North Elmwood factory, which consists of the following departments: Dope, Covering, Panel and Final Wing Assembly.

E. W. Nice has been appointed superintendent of the boat hull department at the North Elmwood plant, replacing Henry Kart, resigned.

Navy Announces More Contracts

Washington, D. C.—The Bureau of Supplies and Accounts of the Navy announced that contracts had been placed with the Curtiss Aeroplane and Motor Corporation, Buffalo, N. Y., for propellers. The Goodyear Tire and Rubber Co., of Akron, Ohio, has been awarded a contract for airships.

Manly 20 Years In Aeronautics

On June 1st, 1898, Charles M. Manly, of the Curtiss Aeroplane and Motor Corporation, joined the illustrious Professor Samuel W. Langley, then secretary of the Smithsonian Institution, in his aeronautical experiments, and he has been at it ever since. Dr. Langley had written to Dr. Thurston of Cornell for a man to take charge of building a man-carrying aeroplane, which included having to secure or construct a power plant. Dr. Thurston told Mr. Manly that he was offering him the greatest opportunity he had ever had to offer to any man. He was right in his vision and wise in his selection.—H. W.

Glenn L. Martin Acquires More Land

Cleveland, O.—The Glenn L. Martin Co. has just purchased an additional tract of land adjoining its large tract where the new factory is located. The new tract, with the 57 acres acquired several months ago, gives the company about 75 acres. An additional railroad frontage of 1,100 feet on the Nickel Plate Railroad is afforded by the recent purchase. The new tract will be used as a flying field, there being a clear sweep of one-half a mile for landing.

Cleveland Pneumatic Tool Adds to New Building

Cleveland, O.—The Cleveland Pneumatic Tool Co. will erect a one-story addition to its plant, to be used as a machine shop.

Aircraft Manufacturers to Train Workers

New York, May 22nd.—In order to meet the demand for skilled workmen many manufacturers are providing means for the instruction of unskilled laborers, according to a report made to the National Association of Manufacturers, by its Committee on Industrial Education. The Curtiss Company, of Buffalo, in great need of trained workers, started a school on March 1st, occupying 30,000 feet of floor space. After six weeks, it was transferring from this training room to the factory 30 workers daily, with an immediate betterment in production throughout the factory. In cable splicing, girls, after four days' training, were doing the best work the Government inspector ever saw, and averaging 55 against 40 in the shop. Another operation took 48 minutes in the training room against 60 in the shop. There is no question there now as to labor supply and production.

The Wright-Martin Aircraft Corporation has training facilities in New Brunswick. The Standard Aircraft Company, of Elizabeth, is now in the process of providing training facilities.

The new factory of the Mayo Radiator Division of the Marlin-Rockwell Corporation at 143rd St. and Southern Boulevard, New York City.

Venus Pencils Make Advertising History

On May 15th, just a little before 10 A.M., the phone rang in the office of the advertising manager of the American Lead Pencil Company, 220 Fifth Avenue, New York.

"The first New York-Washington aeroplane express leaves in an hour and a half—how about running an advertisement in the Washington papers?"

"Can we make it?"

"Yes."

"Go ahead."

At 10 A.M. the advertisement was written and insertion orders made out; at 10:15 a messenger made a dash for the Pennsylvania Terminal Post Office, and he made some speed, arriving at 10:19.

"Just under the wire," remarked the mail clerk, "this mail closes at 10:20."

At 11:30 the first United States Mail Service Aeroplane left New York, reached Washington at 2:50 P.M., and the next day the first pencil advertisement to travel by Uncle Sam's fastest mail was spread broadcast.

First Aircraft Parts Catalogue

The Erie Specialty Company has just issued the first aircraft catalogue which is exclusively devoted to aircraft metal parts. The catalogue is artistically and efficiently assembled. It points out that the Erie Specialty Company has the largest plant devoted exclusively to the production of aeroplane bolts, nuts and clevis pins in the United States. Their process of manufacture has been standardized to conform to the Government specifications, with the result that they are able to turn out aeronautic bolts, nuts and clevis pins on a quantity basis. The catalogue emphasizes the good quality and dependable service which the Erie Specialty Company renders and is an excellent reference book for aircraft manufacturers.

British Make Great Strides in Aeroplane Construction

London, Eng.—Addressing the Bedford Women's Liberal Association on April 11st, Mr. F. Kellaway, Parliamentary Secretary to the Ministry of Munitions, said that the increase for the first two months of the year, compared with the first two months of 1917, was as follows: aeroplanes, 223 per cent; aero-engines, 245 per cent.

The average weekly production of aeroplanes for this year equalled the average production for two months in 1915, while in the case of machine guns, one week's production equalled that of five months' in 1915.

Personal Pars

C. V. Thomas has been promoted from assistant sales manager of the F. B. Stearns Co.. Cleveland, to general sales manager of the company.

Victor Clark Parker, formerly manager of the technical department of the Buick Motor Co., Flint, Mich., has received the commission of major, in charge of the industrial headquarters of the Motor Mechanics Regiment of the Aviation Section. He will be stationed at Camp Greene.

"Titanine" Incorporated in New York State

Albany, N. Y.—Among the new incorporations of May 29th, announced at the office of the Secretary of State of New York, is Titanine, Inc., manufacturers of aeroplane "dopes," varnish and finishing materials, with a capital of $25,000. The incorporators are: Mr. E. G. Davis, R. S. Doubleday, E. T. Costello, of 31 Nassau Street, New York City.

Personal Pars

L. E. Warford, the publicity manager of the Seattle branch of the B. F. Goodrich Company, has been ordered to the School of Military Aeronautics at Berkeley, Cal., following his enlistment in the Aviation Section of the Signal Corps. Mr. Warford has acquired considerable reputation as a publicity expert, not only for his work in connection with the Goodrich Company, but also his service with the Panama-Pacific Exposition and the Pacific Lincoln Highway Association.

Quartermaster Purchases to be Made in 13 Depots

Washington. — The Quartermaster Department has designed its own system for control of purchases of quartermaster supplies. Territory has been allotted to 13 general supply depots located at various points. Each supply depot quartermaster will be charged with the duty of ascertaining manufacturing possibilities of his zone.

This plan wll allow for an equitable allocation of purchases and, as far as possible, equipment for troops at the various camps will be purchased in the zone in which the camp is located. Each supply depot quartermaster will also recommend the employment of such producers as he believes are qualified to fulfill contracts. Each depot will be kept informed as to market conditions. Purchases will be made, after advertisement, by open competitive bidding whenever time permits. A record of bids received and awards made will be open to public inspection.

The states included in the zones assigned to the 13 supply depots are as follows:

Boston General Supply Depot—Maine, New Hampshire, Vermont, Massachusetts and Rhode Island.

New York Depot—New York, Connecticut and New Jersey, north of Trenton.

Philadelphia Depot—New Jersey south of Trenton and Pennsylvania.

Baltimore Depot—Maryland, Virginia and Delaware.

Atlanta Depot—North Carolina, South Carolina, Georgia, Florida and Alabama.

Jeffersonville, Ind., Depot—Ohio, West Virginia, Indiana south of Indianapolis, Kentucky and Tennessee.

Chicago Depot—Indiana north of Indianapolis, Michigan, Wisconsin, Minnesota, North Dakota, South Dakota, Illinois except territory south of Jacksonville, Springfield, Decatur, and Iowa east of Des Moines and Fort Dodge.

St. Louis Depot—Missouri, Illinois south of Jacksonville, Springfield and Decatur, Kansas, Oklahoma and Arkansas.

New Orleans Depot—Louisiana and Mississippi.

Fort Sam Houston Depot—Texas.

Omaha Depot—Iowa from Des Moines, Fort Dodge and west; Nebraska, Colorado, Utah and Wyoming.

El Paso Depot—New Mexico and Arizona.

San Francisco Depot — California, Oregon, Washington, Idaho and Montana.

Aluminum Prices Fixed By War Industries Board

Washington, D. C.—The price-fixing committee committee of the War Industries Board has come to an agreement between the producers of aluminum following investigations by this committee in conjunction with the Federal Trade Commission as to the cost of production. The new maximum base price for aluminum, effective June 1st to September 1st, shall be 33 cents per pound, f. o. b. United States producing plants, for 50 tons or over, of ingot of 98 to 99 per cent. Differentials for sheet, rod, and wire will be increased by approximately 12½ per cent; differentials for quantity and grade and differentials for alloys will remain as heretofore, i.e., those approved by the price-fixing committee of the War Industries Board on March 3rd, 1918.

The conditions upon which these prices are made are, first, the producers of aluminum will not reduce the wages now being paid; second, aluminum shall be sold to the United States Government, to the public in the United States, and to allied governments at the same maximum base price; third, they will take the necessary measures, under the direction of the War Industries Board, for the distribution of aluminum to prevent it from falling in the hands of speculators who might increase the price to the public; and, fourth, they will pledge themselves to exert every effert necessary to keep up the production of aluminum, so as to insure an adequate supply so long as the war lasts.

Auto Dealers to Release Mechanics for War Service

St. Louis, Mo.—At the meeting of the Board of Directors of the National Automobile Dealers' Association, held here on May 19th, plans were discussed for freeing as many mechanics as possible for military purposes. Several recommendations were adopted which, it is hoped, will make possible the freeing of 30,000 skilled motor mechanics for the air service and to take care of the motor trucks being used in France. The elimination of unnecessary service, of Sunday and night work, except for commercial cars, the education of mechanics to do more efficient work, the establishment of a cash basis to eliminate clerical work, the education of automobile owners to make minor repairs, reductions in number of demonstrations, are among the means proposed to reduce the number of mechanics required by the automobile dealers throughout the country.

The Italian Aircraft Industry

Nearly a dozen new companies dealing with aviation have been registered recently, many of which in the Southern Provinces.

The Società Marittima Italiana of Naples, which is an insurance firm going in for aero-transport risk policies, has become a "Società Anonima."

The firm of "Ing. Nicola Romeo & Co." of Milan, has raised its capital from ten millions to thirty millions of lire, and has become the "Società Anonima Italiana" of that name.

Ing. O. Pomilio & Co. are transferring the official headquarters of the business to the capital.

Judging by the budding of business concerns this spring, much fruit should be forthcoming by the summer.

Another of the numerous accessories now in use, and which these notes could not even in peace time adequately deal with, is the Gabbioneta four-bladed petrol pump fitted to the Caproni machines among others. The fitment has gained its place there, and so here, on its merits.

At a ceremony in the memory of the heroic Capuan Captain Oreste Salamone at that place, the High Commissary for Aviation said in his speech: "We must prefer the offensive to the defensive. Italy must be one big trench in the face of the enemy. We have to avenge Salamone and our other martyrs by silent work in preparing more arms, more aeroplanes, more men. . Southern energy and brains must be made available."

By connecting up with a tube two rectangular receptacles set at right angles to each other, and partially filled with a suitable liquid, Engineer Corrado D'Ascanio has evolved a simple foolproof lateral and longitudinal inclinometer. The receptacles are deep, long and norrow, of glass—triplex?—and lie the one transversely to the path of travel, the other parallel to it. Their sides are ruled to show deviation from the horizontal of the lateral or longitudinal axes of the machine.

The "Officine Ferroviarie Meridionali," a big company for railway material at Naples, has started an aviation department for building and repairing aeroplanes, and making spare parts for them, either in wood or metal. The company's nominal capital in 4,000,000 lire.

Another new company of some special importance in view of the development of the South is the "Aeromarittima Italiana" of Naples. Its paid-up capital is 1,500,000 lire.

The Frejus—Diatto motor firm at Turin has been taken over by the people who have so successfully launched the Pomilio concern of that city.

AEROPLANE TIRES

Although American aeroplane tire makers found some precedence established in the British aeroplane tire, they approached the manufacture of aeroplane tires as practically a brand new problem.

The requirements of the service call for the maximum tire strength possible with the minimum of weight. Aeroplane designers, necessarily jealous of every pound of weight that does not contribute directly to flight, subjected the aeroplane tire to their usual searching test of efficiency.

Besides lightness and strength, it was found that one other main requirement must be met. An aeroplane tire is subject to side crashes in landing because of the fact that an aeroplane very seldom lands directly head on. It usually alights at an angle to its line of flight. Therefore, an extra strong, specially reinforced bead is necessary to hold the tire on the rim of an aeroplane wheel.

The tire is the chief cushioning element between the aeroplane and the ground. To secure as much cushioning effect as possible, therefore, aeroplane tires are inflated to only 40 pounds—practically half the pressure in a properly inflated automobile tire.

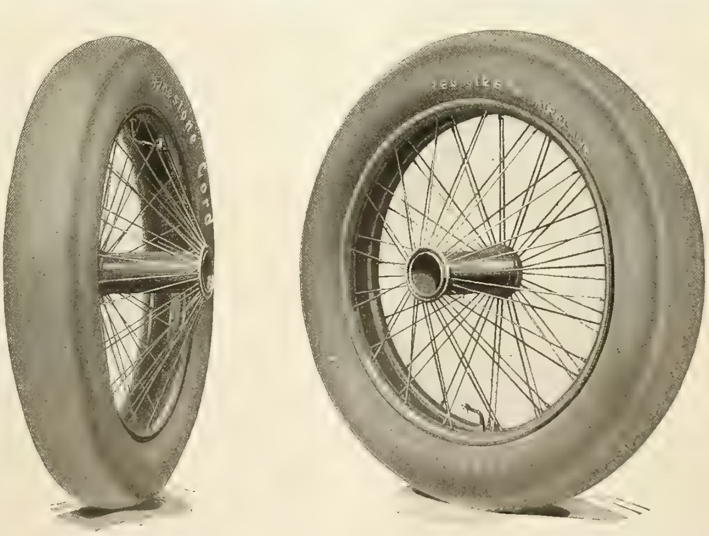
The above conditions of service resulted in the production of the Firestone Areoplane Tire—a tire of 4 ply cord contruction with a specially reinforced bead and a light tread. Although an aeroplane weighs upwards of 1,000 pounds, it was found that a 4 ply cord construction was sufficiently strong, because the weight of the aeroplane rests upon the tire during only a very short part of its flight. As soon as the aeroplane attains a speed of 40 to 50 miles an hour, though it may yet be running along the ground, the actual weight resting on the tire is very little. The only enemy of the tire at this speed is some protruding object which may give the tire a hard knock. But it has been found that the Firestone 4 ply construction is strong enough to withstand all ordinary knocks and even some of extraordinary character.

Still in the Development Stage

So rapid have been the changes in the design of aeroplanes, that the tire manufacturer would be the last to say that the aeroplane tire as it stands today is the final product. Efforts have been made at standardization, and so far the industry seems to have produced tires in two main standard sizes. The first is the 26" x 4" size used mostly on training machines. The other is the 75° x 125 millimeter (about 30" x 5"). Government specifications for aeroplane tires fix the maximum weight of the 26" x 4" tire at 8½ lbs., and the 750 x 125 at 11 lbs.

Other sizes have been agreed upon as standard, but not many tires of these sizes are in use. They are 700 x 75, 700 x 100, 800 x 150 and 900 x 200 millimenters.

The Development Department of the Firestone Company is constantly working on all sizes and new specifications for aeroplane tires to keep pace with the constant change in the design and size of new models of aeroplanes.



The Firestone aeroplane tire

THE FRIEDRICHSHAFEN BOMBING BIPLANE

A Report issued by the Technical Department of the Department of Aircraft Production, British Ministry of Munitions

THIS machine, which bears the mark F.D.H. G.3. 326/17, was brought down by anti-aircraft fire at Isbergues on the night of February 16th. A shell made a direct hit on the right-hand engine at a height of 8,000 to 9,000 feet, after which the machine covered about six miles and made a fairly good landing.

Various parts of the structure bear different dates, that on the tail being 14/1/18. The main spars are branded with a small crown and the letters Z.A.K. The following is painted on the side of the body:—

Leergewicht (weight empty), 2,695 kilogrammes =5,929 lbs.

Nutzlast (useful load), 1,235 kilogrammes = 2,717 lbs.

Zulassiges Gesamtgewicht (permissible total weight), 3,930 kilogrammes = 8,646 lbs.

Crew

This machine carried its full complement of four persons, namely, pilot, fore-gunner, after-gunner, and bomber. It is known, however, that the number of crew varies considerably, as some machines of this type have only carried two persons. The accommodation is so arranged that the personnel can easily change places, all the cockpits being intercommunicating.

General Description

The general design of the machine is shown in the attached drawing, which gives plan and front and side elevations.

The principal dimensions are as follows:—

Span	78 ft.
Maximum chord	7 ft. 8 in.
Gap	7 ft.
Dihedral angle in the vertical plane	1½°
Dihedral angle in the horizontal plane	1°
Total area of main planes	934.4 sq. ft.
Area of upper main planes without flap	480 “
Area of lower main planes without flap	454.4 ”
Load per square foot	9.24 lbs.
Weight per horse power	16.6 lbs.
Area of flap of upper wing	21.6 sq. ft.
Balance area	1.8 “
Area of flap on lower wing	16 “
Balance area	1.56 ”
Total area of fixed tail planes	57.6 “
Total area of elevators	32 ”
Balance area of one elevator	1.7 ”
Area of fin	20 ”
Area of rudder	14.2 “
Balance area of rudder	3 ”
Maximum cross section of body	19.2 ”
Horizontal area of body	133 ”
Vertical area of body	131.2 ”
Length over all	42 ft.

The machine is built up upon a central section, to which are attached the forward and rearward portions of the fuselage and the main planes. This central section comprises the main cell or cabin of the body, containing the tanks, bombs, etc. It also embraces the engines and the central portion of the upper and lower planes. The latter, together with the engine struts, are largely built up of steel tube, as is also the landing gear.

The central portion of the body, which measures 4 ft. across by 4 ft. 3 in. in height, consists of a box formation made of ply wood, strengthened by longerons and diagonals, and transversely stiffened by ply-wood bulkheads. The bulkhead farthest forward acts as an instrument board, behind which are side by side the seats of the pilot and his assistant. The former has a fixed upholstered seat, whilst that of the latter is folding, consisting of a light steel tubular framework with a webbing backrest.

Underneath these two seats is the lower main petrol tank. Behind this cockpit the body is roofed in with ply wood, the rear part of which roofing is detachable so as to give access to the second main petrol tank, which is at the rear end of the main body section. By this means a small cabin or covered passage-way is provided, at each side of which are the racks for the smaller bombs.

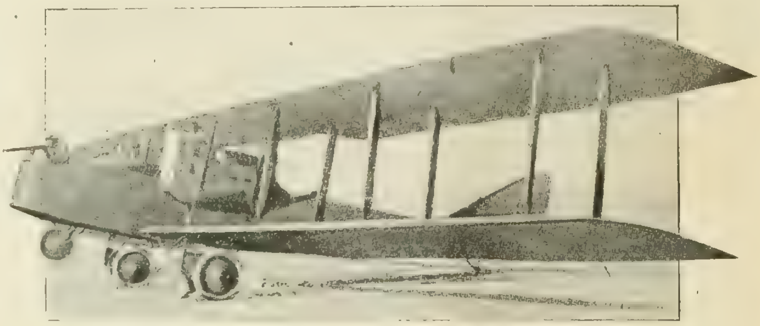
Central Portion of Wings

The central and non-detachable portion of the upper plane has a span of 19 ft. 5 in., whilst at each side of the nacelle the lower plane fixed portion measures 7 ft. 8 in. The main wing spars in this central portion are of steel tube, rougly 2 in. in diameter, with a wall thickness of 1-16 in.

These spars are braced by steel tubes arranged in the form of an X, the manner in which the bracing tubes are attached to the main spars being shown in the sketch Fig 1.

The lugs are built up by welding, and are pinned and riveted in position, the joint being of the plain knuckle type.

The upper surface of the lower plane is, so far as the central section is concerned, covered in with three-ply wood.


The Twin-Motored Friedrichshafen Bombing Biplane

In this portion the main ribs are of three-ply, with spruce flanges. Between each main rib is a cut-away rib, the design of which is shown in the sketch Fig. 2. This, unlike the main ribs, is one piece of wood, and not built up. For the greater part of its length it applies to the top surface only, being cut away to pass clear of the cross bracing tubes.

The plane is further stiffened with transverse members consisting of three-ply panels between each rib strengthened by grooved pieces top and bottom. The latter are attached as shown in the sketch Fig. 3, and the attachment of the flanges of the main ribs is shown in Fig. 4.

The central section of the upper main plane is in one piece and is covered top and bottom with fabric. In order to facilitate the removal of the engines, detachable panels measuring 1 ft. 11½ in. long by 1 ft. 8 in. deep are let into the trailing edge immediately over the engine bearers. These panels are socketed in front, and at the rear are joined up at the trailing edge with U section sheet steel clips and bolts.

The struts which connect the top of the nacelle to the upper plane are tubular and of streamline section, as are also the engine bearer struts. A section of one of the latter is given in Fig. 5. The thickness of the wall is one-sixteenth of an inch.

The method of attaching the lower end of the engine struts to the tubular steel spars is shown in the sketch Fig. 6, from which it will be seen that a welded Y socket is used and secured by a pin joint, the ends of the pin acting as anchorages for the attachment of the bracing wires.

This sketch also shows the lugs which respectively support the detachable portion of the main planes and the vertical strut of the landing chassis. The engine bearer struts are pushed into the Y socket and pinned in position, the pins being afterwards brazed into the socket. At their upper ends the engine struts are fixed to the top plane spars with pin joints, as shown in Figs. 7 and 8, the attachment differing according to the number of wire bracings that are to be taken to each joint.

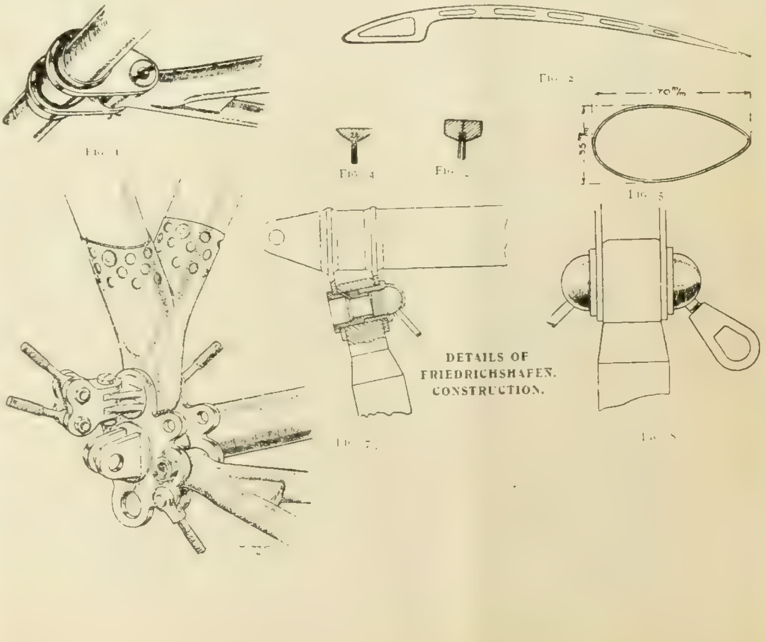
Construction of Wings

The detachable portions of the wings are fixed to the centre section by pin joints, one part of which is shown in Fig. 6, the male portion being represented in Fig. 9. The chord of the wing in the line of flight varies from approximately 7 ft. 8 in. to 7 ft. 5 in., and the wing section is shown shaded in Fig. 10. In order to provide a basis of comparison the R.A.F. 14 wing section is superimposed and drawn to the same scale.

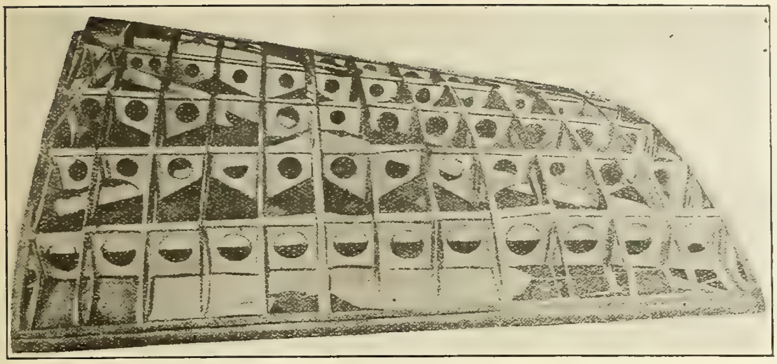
The main spars are placed one metre apart, the front spar being 272 mms. in the rear of the leading edge. Both spars are of the built up box type, as shown in Figs. 11 and 12. The former is the leading spar and the latter the rear spar. These spars are of spruce, and each half is furnished with several splices, so that the greatest single length of timber in them is not more than 14 ft. The splices, which occur in each half alternately, are of the plain bevel type about 15 in. long and wrapped with fabric. A fabric wrapping is also applied at short intervals along the spar.

Internal cross bracing between the main spars is afforded by steel tube cross members and cables attached as shown in the sketch Fig. 9.

The main spar joint consists of a steel plate 19 mms. thick embedded in the spar end and held in position by 5 bolts, which pass through a strapping plate surrounding the end of the spar. This plate also carries the attachment for the bracing cable and is furnished with a spigot which locates the bracing tube. It will be seen



DETAILS OF FRIEDRICHSHAFEN CONSTRUCTION.



Centre section of lower main plane with three-ply surfacing removed

that at this point the spar is provided with tapered packing pieces of hard wood glued and held in position by fabric wrapping.

The main ribs are placed 360 mms. apart. Between them are auxiliary formers, consisting of strips of wood 20 mms. × 10 mms. thick, which run from the leading edge to the rear spar. The main ribs consist of ply wood webs socketted into grooved spruce flanges, which are tapered off as shown in Fig. 4, except where they are met by a longitudinal stringer. The leading edge is solid wood moulded to a semi-circular section of approximately 65 mms. diameter. Where the rib web abuts against it, packing pieces are glued each side. Between the main spars the web of the rib is divided by three vertical strips into four panels and in each of these it is perforated, leaving an edge all round about 72 mms. wide.

As shown in Fig. 9, the upper flange of the main ribs is carried clear of the leading spar by means of packing pieces. In the case of the rear spar, packing pieces are also used under the rib flange as shown in Fig. 12.

The lower main planes for a width of about 2 ft. 3 in. at their inner end are covered as to their top surfaces with three-ply wood.

The interplane struts are attached to the main spars by joints of the type shown in Fig. 14. This, it will be seen, follows the typical German practice of partially universal jointed mountings for the cable attachments. At the points of attachment of these strut joints, suitably tapered packing pieces of hard wood surround the spars, which at these points are also wrapped with fabric.

Struts

Outside of the centre section the interplane struts are of wood built up, as shown in the section Fig. 15, of five separate pieces. The curved portions are of timber which has not yet been identified, but is apparently of poor quality. The cross web is of ash. The strut is wrapped at frequent intervals with strips of fabric and is fitted with a socket joint of the type shown in Fig. 16. The outer pair of struts are of smaller section than the main struts, but are built up in a similar manner. Their section is 125 mms. × 40 mms.

Ailerons

The framework is principally of welded steel tube wrapped with fabric.

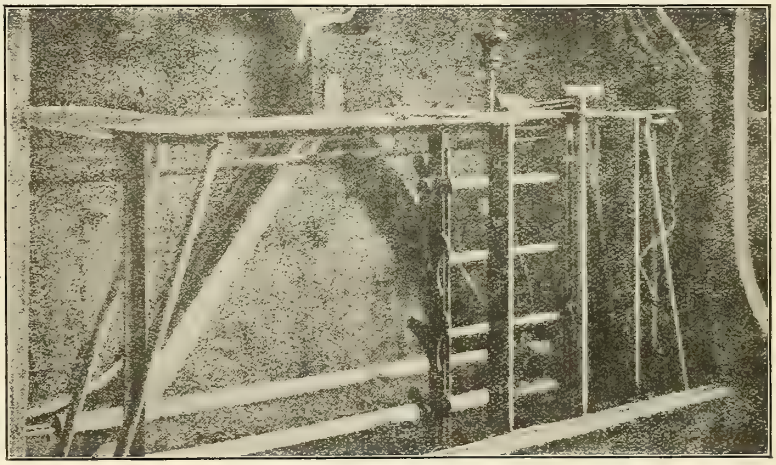
A notable point is the thick section of the leading edge of the balanced portion, as shown in Fig. 17.

Fin and Fixed Tail-Planes

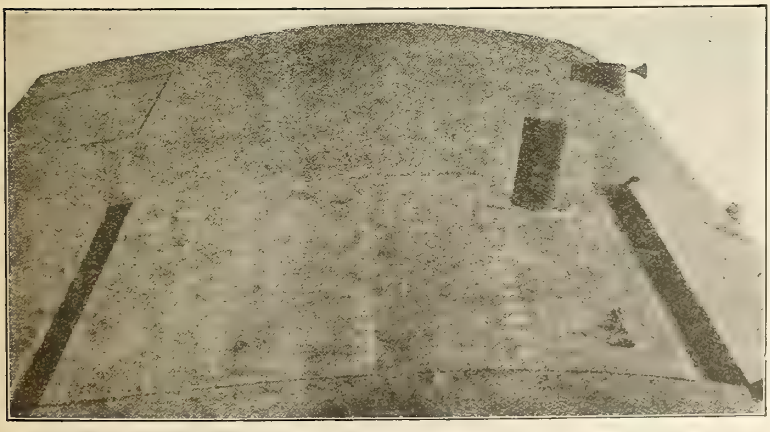
The framework of these is steel tube and in the case of the tail-planes wooden stringers running fore and aft are arranged at intervals. The tail-planes are supported by diagonal steel tubes of streamline section, on the under side of which sharp steel points are welded to prevent these stays being used for lifting purposes.

Elevators and Rudders

The framework in each case is of steel tube, the main tube being 35 mms. in diameter and the remainder 15 mms.



View of the bomb rack in the fuselage



Gravity gasoline tank set into the centre section of the upper plane. Its fabric cover is held down by press buttons. Note the detachable panel in the trailing edge of the plane

Bracing

Throughout the wings, both internally and externally, the bracing is by means of multistrand steel cable.

Fuselage (Rear Portion)

At the after-gunner's cockpit the section of the fuselage has a rounded top, which is gradually smoothed down into flat. The section, for the greater part of the length, is rectangular, and the frame is built up in the usual manner with square section longerons and verticals, the joints being arranged as shown in Fig. 18. The cross bracing wires along the sides, top, bottom, and diagonal are of steel piano wire and are covered with strips of fabric, as shown in this sketch, where they lie adjacent to the fabric fuselage covering.

The vertical and horizontal compression members are located by spigots. The joint consists of a plate which completely surrounds the longerons, its two ends being riveted together to form a diagonal bracing strip. For the last few feet at the tail the fuselage is covered with thin three-ply.

The fuselage is covered with fabric, which is held in position by a lacing underneath and is consequently bodily removable.

The floor of the after-gunner's cockpit is elevated above the bottom of the fuselage. Immediately underneath this cockpit is a large trapdoor, shown by dotted lines in the plan view of the aeroplane. This is hinged at its rearward end and furnished with two large celluloid windows. It is held in its "up" position by a long spring and a snap clip. No means could be found by which it could be fixed in its closed position. As footsteps are provided for all the cockpits, this trap-door is evidently not intended for ingress and egress. It could be employed in connection with a machine-gun firing backwards, as in the Gotha, but no machine-gun mounting was fixed in this machine for this purpose.

The rear portion of the fuselage is attached to the centre section of the body by a clip at each corner. This is shown in Fig. 19. The rear portion carries a male lug, which engages with the two eyes, and is held in position by a ⅜ths bolt. Four other bolts in tension pass through the sheet metal clip, as shown in the sketch. In each case the lugs are furnished with sheet steel extensions which, as shown in the sketch Fig. 19, are sunk flush into the top and bottom surfaces of the fuselage longerons and are there held with three bolts. The corner joint is welded sheet steel, and there is an additional diagonal sheet steel point which serves the secondary purpose of providing an anchorage for the bracing wires.

As this fuselage joint is level with the plane of rotation of the propellers, it is armoured both on the nacelle and on the rear portion of the fuselage with a hinged covering of stout sheet steel lined with felt. A plate of armour a foot wide also extends down each side of the nacelle at this point.

Forward Cockpit

This is attached to the main body by four bolts with clips similar to those just described. It consists of a light wooden framework, covered throughout by three-ply.

The cock-pit can be divided off from the main cockpit by means of a fabric curtain. Its occupant is provided with the folding seat, and manages a gun and the bomb-dropping gear.

Engine Mounting

The engine bearers have the section shown in Fig. 20, and are each built up of two pieces of pine united by tongues. On their top surface they are faced with ply wood, and at the bottom with ash. A strip of ash applied to the upper outer corner of the bearer gives it an L section, and has screwed into it the threaded sockets for the set screws of the lower part of the engine fairing. The engine bearers taper sharply at each end. They are mounted on the "V" struts by means of acetylene welded brackets, constructed as shown in sketch, Fig. 21. These, it will be seen, are of box form, and form a liner round the streamline tube.

The engine cowling is a particularly fine piece of work, and two views are given in sketches 22 and 23. The lower portion is attached to the engine bearers by set screws, but the upper part is readily detachable, being furnished with turn buttons. This cowling allows the cylinders of the engine to be exposed to the air. A large scoop is placed in front, so as to permit a free flow of air over the bottom and sides of the crankchamber, whilst at the rear three large trumpet-shaped cowls are provided so that a draught of air is forced against the crankcase in the neighborhood of the carbureter air intake. In the rear the fairing abuts against the propeller nave, whilst in front it is attached to the radiator. It will be noticed that at each side of the radiator are narrow air scoops, the object of which is to promote a draught past the oil tank and front cylinder heads.

Engines

The motors are the standard 260-h.p. Mercedes with six cylinders in line. Full details of this engine have been published, and it is only, therefore, necessary to notice one or two points in connection with the installation.

A new departure is the interconnection of the throttle and ignition advance controls. This is carried out in the manner illustrated diagrammatically in Fig. 24. It will be seen that a considerable movement of the throttle can be made independently of the ignition advance. In the Mercedes carbureter the throttle is so arranged that it cannot be fully opened near the ground without providing too weak a mixture, and it is thought possible that the full ignition advance is not obtained until this critical opening is reached.

On several German bombing aeroplanes grease pumps for lubricating the water spindle have been found. Fig. 25 shows the design as fitted to the Friedrichshafen. It consists of a ratchet and pawl operated grease pump, secured by a bracket to one of the engine struts, and worked from the pilot's cockpit by a lever, and a stranded steel cable pasing over a pulley, the pawl being returned by a long-coiled spring.

The engine numbers are respectively MN.-32299 and MN.36228.

The exhaust pipe is of new design, although it incorporates the well-known expansion joints attached to the flanges. It is fitted with what amounts to a rudimentary silencer, whereas in previous machines of a similar type to the Freidrichshafen an open-ended exhaust pipe was used.

Radiators

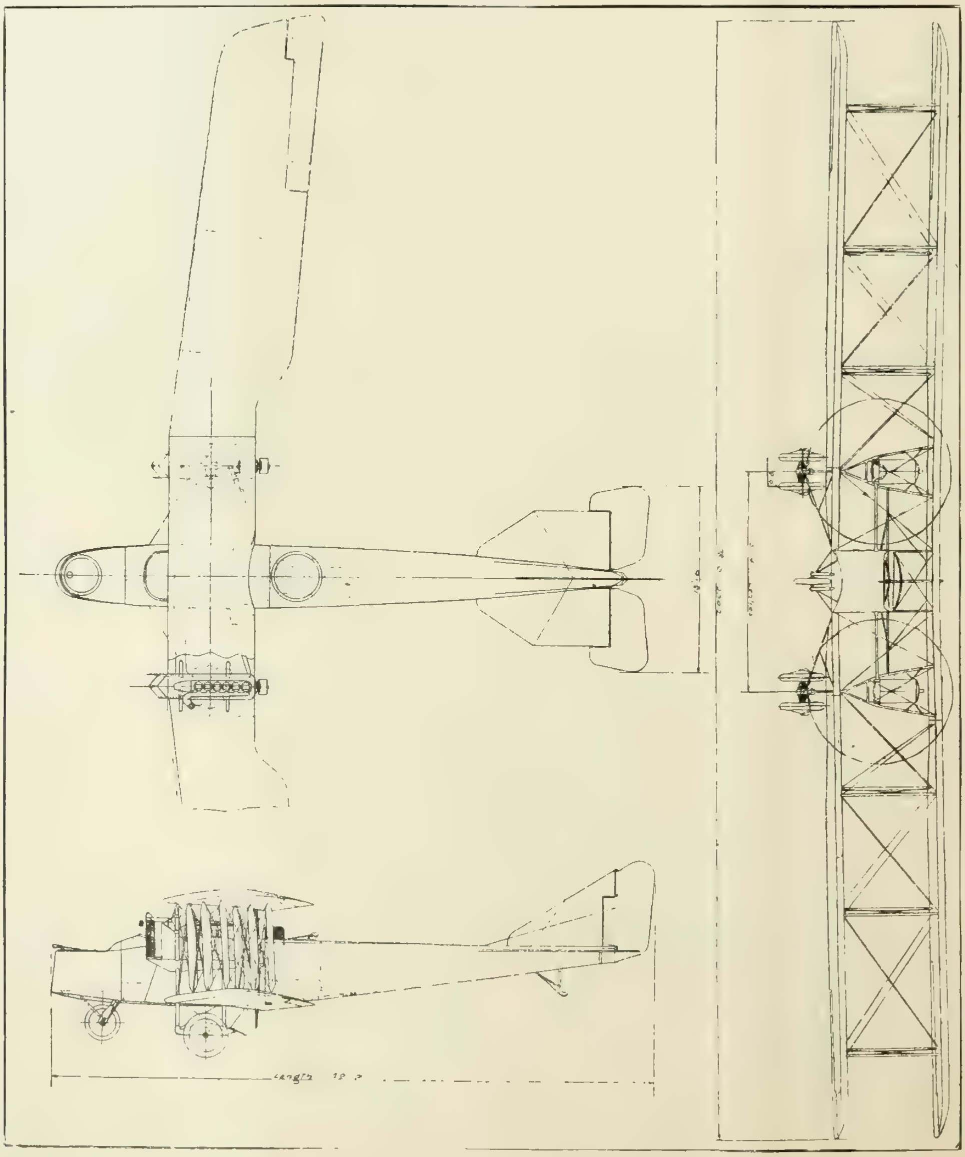
Each radiator is provided with an electric thermometer fitted into the water inlet pipe, as shown in sketch, Fig. 27, these thermometers being wired up to a dial on the dashboard, which is furnished with a switch, so that the temperature of either radiator can be taken independently.

The radiators consist of square tubes to the number of 4,134, and measuring roughly 6 mms. each way.

The radiator block is V shaped in plan, and each is provided with a shutter which covers up a little more than a third of the cooling surface. This shutter is fitted with a stop, so that when fully opened it lies in the line of flight of the aeroplane. It is opened or closed according to circumstances by the gear, shown in the sketch, Fig. 26, of which the handle is mounted on the roof of the nacelle, immediately behind the pilot's seat. Three positions are provided for the handle, which operates the two shutters simultaneously by means of return cables.

Immediately above the main radiator, and let into the upper main plane between the front spar and the leading edge, is a small auxilliary tank, illustrated in Fig. 28. This is furnished with a trumpet-shaped vent in the direction of the line of flight, and is furnished with two outlets, one to the head of the main radiator, and the other to the water pump. The function of this tank is evidently to prevent the pump from priming.

(*To be continued*)



Line Drawings of the Twin-Motored Friedrichshafen Bombing Biplane

CALCULATION OF STRESSES IN AEROPLANES

By S. E. SLOCUM, Ph. D.

(*Concluded from page* 539)

SECTION 3

Fuselage Stresses

THERE is apparently quite a variety of designs used in the construction of the body, or fuselage, of aeroplanes, but on analysis it is found that so far as the structural features are concerned the various forms of fuselage may be divided into three general types, namely,

The girder type;
The monocoque, or cylindrical shell type;
The combined girder and monocoque type.

Of these three types, the first is the most common, especially in this country, and is the form of construction used in the biplane analyzed in this series of articles.

As apparent from Figure 14, the fuselage of this machine consists of longitudinal members running the entire length of the body, connected by struts and ties so as to form trusses in both the horizontal and vertical planes. The truss shown in Figure 14 is known as the Linville or N type. The Warren truss, often used in bridge work, is also frequently used for fuselage trusses.

When the machine is in the air, both the front and tail portions of the fuselage constitute cantilevers projecting in opposite directions from the center of support. As the method of calculating the stresses is the same for both portions, only the tail portion of the fuselage will be analyzed in this article.

Amount and Distribution of Dead Load

The weights and dimensions needed for the calculation of dead loads are as follows:

Framework	Longitudinals from Station I to V	1" x 1" spruce
	Longitudinals from Station V to XII	1¼" x 1¼" ash
	Cross frames from Station I to VI	1" x 1" spruce
	Cross frames from Station VI to XII	1¼" x 1¼" ash
Areas of control surfaces and fins.	Fixed horizontal fin	25 sq. ft.
	Elevators (two)	20 sq. ft.
	Vertical fin	5 sq. ft.
	Rudder	10 sq. ft.
Unit weights.	Spruce	25 lbs./cu. ft.
	Ash	38 lbs./cu. ft.
	Control surfaces and fins	0.5 lb./sq. ft.
	Fuselage covering	0.75 lb./sq. ft.
	Cowl assumed as	5 lbs./panel
	Wires, turnbuckles and connections	3 lbs./panel
Total weights.	Horizontal fin, 25 x 0.5	12.5 lbs.
	Elevators, 20 x 0.5	10 lbs.
	Vertical fin, 5 x 0.5	2.5 lbs.
	Rudder, 10 x 0.5	5 lbs.
	Rudder post	10 lbs.
	Tail skid	5 lbs.
	Cockpit load, assumed as	
	Aviator 160 lbs.	
	Control 20 lbs.	
	Seat and flooring 20 lbs.	200 lbs.

For the tail portion of the fuselage the total dead loads carried at the various panel points, or stations, may then be tabulated as follows:

Distribution of Dead Loads.

Dead weights of	Stations						
	I	II	III	IV	V	VI	VII
Longitudinals	0.7	1.4	1.6	1.7	1.9	4.8	3.3
Cross frames	...	0.7	1.0	1.1	1.4	2.4	4.1
Wires and con.	3	3	3	3	3	3	3
Covering	0.3	0.7	1.1	1.2	1.5	1.6	1.5
Cowl	...	...	...	5	5	5	5
Horizontal fin	5	7.5	...	...	...	...	...
Elevators	10	...	...	...	...	...	...
Vertical fin	1	1	0.5	...	...	...	.
Rudder	5	...	...	...	...	...	...
Rudder post	10	...	...	...	...	...	..
Tail skid	5	...	...	...	...	...	...
Cockpit load	...	...	...	...	...	100	100
Total dead load	40	14.3	7.2	12	12.8	116.8	116.9

Wind Loads

The principal load on the rear fuselage trusses is that due to the wind pressure acting on the fixed horizontal tail fin, or stabilizer, and on the movable control surfaces or elevators. In determining the wind loads on these surfaces it is necessary to take into account their maximum inclination to the direction of motion at the maximum speed of the machine. Recent U. S. Government specifications required that the tail portion of the fuselage be designed under the following conditions:

Angle of incidence of fixed horizontal fin, — 6 degrees;
Angle of incidence of elevators.......... —20 degrees.
Air velocity equal to maximum speed of machine.

Under these conditions the factor of safety was specified as not less than 2.5. This factor was intended to cover structural requirements only, as the angles of incidence specified are such as to provide for the maximum wind loads.

The most reliable data from which to determine air pressures are those resulting from Eiffel's experiments.*

Eiffel's method consisted in first determining the pressure on flat plates normal to the wind, the final result under these conditions being expressed by the formula

$$P = 0.0033\, A\, V^2$$

where P = normal pressure in lbs./sq. ft.
A = area of surface in sq. ft.
V = velocity of wind in miles/hour.

In the present case the maximum velocity of the machine is approximately 60 miles per hour. For this velocity the maximum normal pressure as given by the above formula is found to be

$$\frac{P}{A} = 11.88 \text{ lbs./sq. ft.}$$

For an inclined surface, the pressure has been determined by Eiffel for plates of various aspect ratios and angles of incidence in terms of the pressure on the same plate when placed normal to the wind. In the present case the fixed horizontal fin has an aspect ratio of about 3 to 1, and the angle of incidence is specified as 6 degrees. Under these conditions the pressure as determined by Eiffel's experiments is given as

Max. pressure $= 0.31\, P = 0.31 \times 11.88 = 3.68$ lbs./sq. ft.,

and consequently we have

Max. wind load on horizontal fin $= 3.68 \times 25 = 92$ lbs.

This wind load may be considered as distributed between Stations I, II, and III, one-fourth, or 23 lbs., being carried at Station I; one-half, or 46 lbs., at Station II, and the remaining one-fourth, or 23 lbs., at Station III.

For the elevators the aspect ratio is about 1.5 to 1, and the angle of incidence is specified as 20 degrees. Under these conditions the pressure as determined from the same set of experiments is given as

Max. pressure $= 0.82\, P = 0.82 \times 11.88 = 9.74$ lbs./sq. ft.,

and consequently we have

Max. wind load on elevators $= 9.74 \times 20 = 195$ lbs.

This wind load is all carried at Station I.

The total loads carried at the various panel points or Stations are then as follows:

I	II	III	IV	V	VI	VII
40	14	7	12	13	117	117
195	46	23				
23						
258	60	30	12	13	117	117

Since each of the two side trusses carries half the load, the panel loads carried by one truss are half the above amounts. Hence assuming the nearest round number or integer, the final distribution of loads may be represented as shown in Figure 15.

Note that the wind loads occur at the top panel points, while the cockpit loads occur at the bottom panel points. The dead loads should in reality be distributed between the top and bottom panel points, but since they are all comparatively small, they are placed at the top panel points except at Stations VI and VII, where they are included with the cockpit loads. The effect of placing the dead loads at the top panel points is to increase the stresses in the web members.

Analytical Calculation of Stresses

The stresses in the members may be calculated either analytically or graphically. Both methods will be explained in what follows, as the analytical methods is probably more familiar and has the advantage of making it possible to calculate the stress in any one member independently of the others; while the graphical method has the advantage of showing at a glance the relative proportion of stress in the various members. In the present case the graphical analysis is easier to apply on account of the inclination of the upper and lower chords.

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*Eiffel: Resistance of the Air and Aviation, pages 36 and 118.

In analyzing a truss graphically, the most convenient notation is to place letters in the spaces between the members instead of at the joints. The letters on opposite sides of any member then indicate this member. The advantage of using this notation is that the letters indicating any member will occur at the ends of the corresponding line representing the stress in this member on the stress diagram. To avoid confusion, this notation will be adopted in the analytical calculations as well as the graphical analysis so that the same letters will refer to the same numbers throughout.

When the machine is in the air, only one set of diagonals is in action as indicated in Figue 15. The opposite set of diagonals carry the load when the machine is resting on the ground or taxying. The loads in this case are in general considerably less than when the machine is in the air, except possibly in case the machine should light violently on the tail skid. Provision may be made for this case in calculating the ground stresses by assuming that the impact load is twice the actual dead load.

From Figure 14 it is apparent that the wire diagonals intersect practically on the center line of the longitudinals. In calculating the stresses, therefore, they are figured from a skeleton diagram constructed on the center line of the members. The effective dimensions for the calculation of stresses are then as shown on Figure 15.

The stresses in the longitudinals, or chord stresses as they are called, may be found by taking a vertical section through the given member and applying the principle of moments. Before proceeding with this, however, it will be necessary to determine the inclinations of the upper and lower chords, which are as follows:

Inclination of upper chord to horizontal,

From Stations I to VI ....2°
" " VI to VII ....1° 55′
" " VII to VIII.......1° 32′

Inclination of lower chord to horizontal,

From Stations I to VI ....3° 10′
" " VI to VII ....2° 52′
" " VII to VIII.......1° 32′

Now to find the stress in any member, say *FQ*, Figure 15, pass a vertical section through this member and consider the portion on the left of the section. Taking the point 3 for center of moments, the sum of the moments of the external forces with respect to this point is

$$\text{Sum ext. mom.} = 130 \times 12 + 30 \times 10 + 15 \times 8 + 6 \times 5.5 + 7 \times 3 = 2034 \text{ ft. lbs.}$$

Since the distance between the points 1 and 3 is 26 inches, the lever arm for *FQ* with respect to the point 3 is 26 × cos. 1° 55′ = 25.984 inches.

Therefore

$$FQ \times 25.984 = 2034 \times 12,$$

whence

$$FQ = 940 \text{ lbs. tension.}$$

To find the stress in the lower chord *AP*, take a vertical section cutting *AP* and choose the point 1 as center of moments. The external moment with respect to this point will then be the same as above, namely, 2034 ft. lbs. Moreover, since *AP* has very nearly the same inclination to the horizontal as *FQ*, the lever arms will be practically the same for both, and consequently the stress in *AP* will also be of the same amount, namely, 940 lbs., but compression instead of tension.

Similarly, to find the stress in *RV*, take the center of moments at the point 2, giving the equation

$$RV \times 28.5 \times \cos. 2^\circ\ 52' = 2654 \times 12,$$

whence

$$RV = 1120 \text{ lbs. compression.}$$

By this method of sections, the lower chord stresses may be found by taking centers of moments at upper chord panel points, and the upper chord stresses by taking centers of moments at lower chord panel points.

In finding the web stresses, consider first the diagonals. To find the stress in any diagonal, say *QR*, take a vertical section through this panel. Then applying the condition

$$\text{Sum of vertical forces} = O,$$

since the inclination of *QR* to the vertical is found to be 48° 1′, we have

$$130 + 30 + 15 + 6 + 7 + 60 = FQ \sin 2^\circ + RV \sin 3^\circ\ 10' + QR \cos. 48^\circ\ 1'.$$

From the previous calculations we have

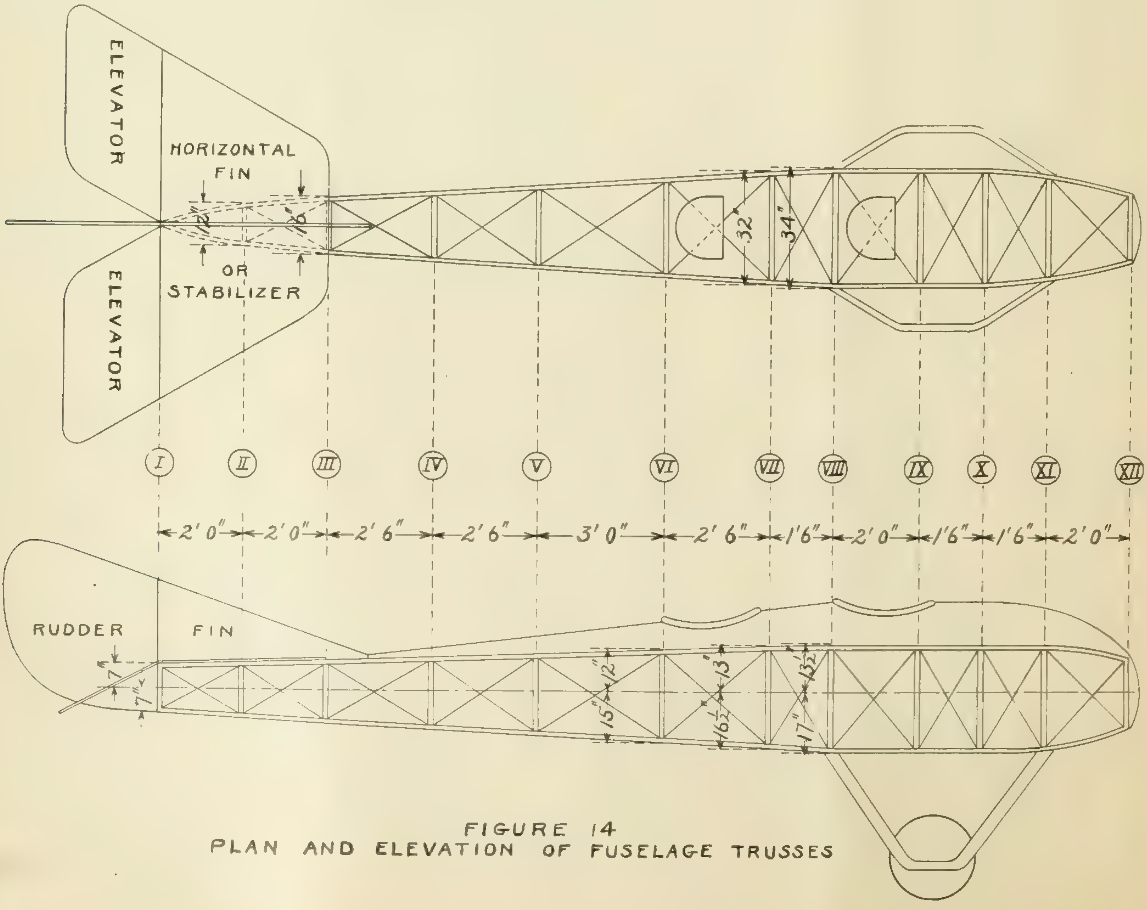


FIGURE 14
PLAN AND ELEVATION OF FUSELAGE TRUSSES

$$FQ = 940 \text{ lbs. and } RV = 1120 \text{ lbs.}$$

Substituting these values in the above equation, we have, therefore,

$$QR = 240 \text{ lbs. tension.}$$

The stresses in all the other diagonals are determined in a similar manner.

To find the stress in any vertical, say *PQ*, take a diagonal section cutting this vertical the upper chord *FQ* and the lower chord *AP*. Then from the condition

$$\text{Sum of vertical forces} = O,$$

we have the equation

$$130 + 30 + 15 + 6 + 7 = FQ \sin 1° \, 55' + AP \sin 3° \, 10' + PQ,$$

whence, by substituting the values found above for *FQ* and *AP* we find

$$PQ = 105 \text{ lbs. compression.}$$

The stresses in the other verticals are found in a similar manner.

Graphical Calculation of Stresses

The graphical analysis of stresses in a truss depends on the principle that if any member of forces meeting in a point equibibrate, then if these forces are laid off to scale in succession, they must form a closed polygon. If the directions of the concurrent forces are known, this principle therefore makes it possible to determine the amount of any two of them; that is to say, it determines the length of two sides of the force polygon corresponding to the point considered.

Beginning at the left end of the truss (Figure 16) it is evidene that the stress in the end post *AG* is equal to the load of 130 lbs. or *AB*, and that the stress in *BG* is zero.

Now proceeding to the lower panel point, we have three forces meeting in this point, namely, *AG, GH, HA,* one of which, *AG,* = 130 lbs., is known. Therefore, laying off *AG* to scale and forming a force triangle by drawing the lines *GH* and *AH* parallel to the corresponding members of the truss, their point of intersection *H* is determined, and by scaling off the length of these lines it is found that *AH* = 205 lbs. and *GH* = 235 lbs.

Next pass to the upper panel point where the load of 30 lbs. is applied. Of the five forces meeting in this point, three have been determined and two are unknown. In laying off the force diagram for any point, it is always necessary to take the forces in order around the point. Starting, therefore, with *HG* and moving clockwise around the point, the forces *HG, GB,* and *BC* are already laid off on the force diagram. Therefore from *C* draw a line parallel to the member *CI*, and from *H* draw a line parallel to the member *HI*, thereby determining the point *I*. Then scaling off the length of the two sides so determined, we find *HI* = 140 lbs. and *CI* = 205 lbs.

Proceeding in this manner by taking the joints in succession and following the zig-zag course indicated by the web members, we finally obtain the complete stress diagram as shown in Figure 16. This is called a Maxwell diagram.

Sizes of Members

In order to determine the stresses in the fuselage trusses it was necessary to assume the dimensions and weights of the members. It is now possible to check up on the design by finding the factors of safety of the various members. If these are found to be either too large or too small it will be necessary to change the dimensions of the corresponding members, but as the dead loads are small in comparison with the wind loads, a slight change in the size of the members will not materially affect the stresses.

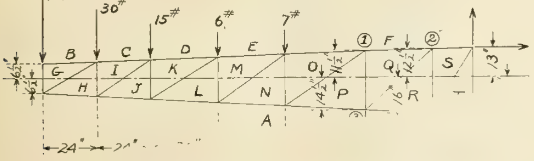


Fig 15. Skeleton diagram of fuselage truss

Consider first the diagonals. These are of piano wire for which the ultimate strength is specified as not less than 250,000 lbs./sq. in. Assuming three different sizes of wires, the breaking loads corresponding to these diameters and the safe loads for a factor of safety of 5 are then as follows:

Diameter in inches	Breaking load in lbs.	Safe load in lbs.
0.08	1250	250
0.09	1600	320
0.10	2000	400

Referring to the stress diagram, it is evident that all the diagonals from the end to and including *QR* may be made of wire 0.08″ in diameter, and *ST* of wire 0.09″ in diameter.

Proceeding to the compression members, the longitudinals and cross frames are made of spruce for the smaller stresses, and of ash for the larger. The strut formula given in section 1 of this article, however, applies to spruce only. Another strut formula is therefore required which applies to ash as well as to spruce. There is an English formula which applies to both materials, based on a modified form of Rankine's column formula, and which is as follows:

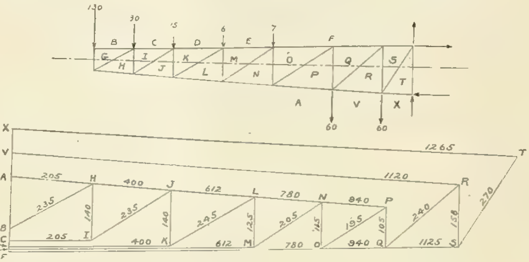


Fig. 16. Graphical analysis of stresses in fuselage truss

$$\frac{P}{A} = \frac{b}{l + c}\left(\frac{l}{\ }\right)^2$$

where P = breaking load in lbs.
A = area of cross section in sq. in.
l = length in inches
k = least radius of gyration in inches
b and c are empirical constants

The values of the empirical constants *b* and *c* for pin jointed struts have been experimentally determined as follows:

For spruce, $b = 5{,}600$
For ash, $b = 6{,}250$

The value of *c* depends on the ratio *l/k* and in the original derivation of the formula is shown graphically on a chart. The following values taken from this chart cover the range to which the formula applies.

l/k	Values of l/c	
	Spruce	Ash
60	11,000	10,000
80	10,000	9,000
120	8,000	7,000
160	6,500	5,000
200	5,000	4,000
240	4,000	3,000
280	....	2,800

Now the member *AP* is made of ash of dimensions 1¼″ x 1¼″ x 36″. Consequently $k = 0.36''$ and $l/k = 100$, and substituting in the above formula the breaking load is found to be 4,330 lbs. Since the actual compression carried by *AP* is 940 lbs., this gives a factor of safety of 4.6.

The member *RV* is also made of ash of dimensions 1¼″ x 1¼″ x 30″. Hence $k = 0.36''$; $l/k = 83.3$, and from the formula, $P = 5{,}500$ lbs. Since the load carried by the member is 1,120 lbs., the corresponding factor of safety is 4.9.

Again, the member *NA* is made of spruce, 1″ x 1″ x 30″, for which $k = 0.289''$ and $l/k = 104$. The breaking load is therefore 2,550 lbs., and dividing this by the actual load, 780 lbs., the factor of safety is 3.3.

The sizes of the other compression members may be checked in a similar manner.

The formula from which these results are obtained is based on the assumption that the struts are pin jointed. As the longitudinals are continuous throughout, they can, of course, carry a greater load than if pin connected at the panel points. As it is difficult to determine just how much the effect of stiff joints increases the strength of the members, it is customary to proceed as above with the understanding that this method gives the lower limit of the factor of safety, and that the longitudinals are actually somewhat stronger than appears from the calculations.

In addition to the analysis for vertical loads, given above, the tail portion of the fuselage must be designed to carry the horizontal loads produced by steering or by a side wind striking the rudder and vertical fin; and also to carry the torsional strain produced by the action of the empennage in balancing the torque of the propeller. The horizontal loads are relatively small, however, as compared with the vertical, and the stresses produced by them are taken up by the horizontal web system shown in plan in Fig. 14. The effect on the longitudinals is to produce a small increase in compression in the bottom longitudinal of the leeward truss.

The torsion effect is taken care of by wire diagonals passing obliquely from the upper left hand corner of one side panel to the lower right hand corner of the opposite side panel.

NAVAL and MILITARY · AERONAUTICS ·

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AEF—On duty with the American Expeditionary Forces.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BRN—Report to Bakers Field, Rochester, N. Y.
BFT—Report to Barron Field, Fort Worth, Texas.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAG—Report to Camp Hancock, Augusta, Ga.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MMP—Report to Middletown Aviation Supply Warehouse, Middletown, Pa.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RRV—Report to Aviation Depot, Richmond, Va.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Spruce Division, Yeon Bldg., Portland, Ore.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to points named in order mentioned for temporary duty.

Note 2—Report to chief of war plans division of General Staff for duty with inventions section.

Note 3—Proceed to Dayton, Ohio; Elgin, Ill.; Buffalo, N. Y. and Camp Greene, Charlotte, N. C.

Note 4—Report to aviation general supply depot, San Antonio, Texas.

Note 5—Proceed to Camp Greene, N. C., for temporary duty.

Note 6—Report to Camp Jackson, Columbia, S. C.

Note 7—Report to chief of army baloon inspection, Akron, Ohio.

Note 8—Report to U. S. General Hospital, Fort Bayard, N. Mex., for treatment.

Note 9—Report to Capt. Edwin B. Lausier, finance dep't Signal Corps, 480 Lexington Ave., New York City.

Note 10—Report to general supply depot, Fort Mason, Cal.

Special Orders No. 115 to 120, Inc.

A	
Anderson, Wallace A.	ASM
Allen, William R.	Note 2
Armstrong, Ralph Sheldon	SLR, LDT
Alexander, William Homer	SLR, KST
Anderson, Edward	SLR, KST
Atlas, Charles Elihu	SLR, KST
Archibald, James Alber	SLR, PMT
Ankemy, John Calvin	SLR; EOT
Anspach, Paul Parker	SLR; EOT
Andrews, Paul S	FRF, RTR
Allen, George E.	DIK
Alton, Darrell D.	DIK
Angier, Corlies	SLR GLC
Adams, James Ellsworth	SLR, RSD
Aleshouck, Joseph William	SLR, GLC
Arnold, Ivan T.	BST
Auchard, Oliver C.	FRF
Ackerman, Edgar M.	UTA
Anderson, Fred C.	RTR
Armitage, George T.	RTR
Arnold Henry R.	DIK
Abbott, Edwin Irving	SLR DIK
Addington, Edward P.	DIK
Ames, Stanley Mitchell	SLR
Avera, John William	SLR; DIK
Ainsworth, Cyril	SLR
Austin, Galvin Eustace	SLR; BFT
Adams, James E.	FRF
Allen Albert Alonzo	SLR; LDT
Allan Roy Folger	SLR; EOT
Adams, Quinlan	KST
B	
Bailey, Dan Wood	SLR; CRI
Brown, Orlo William	FLR; VBW
Burnet, Gilbert William	SLR; KST
Buell, Harry C.	Note 10
Bliss, Abel Brockway	SLR; VBW
Billings, Roy Hea on	SLR; VBW
Bowen, Clark B.	SLR; RSD
Baxter, Donald Kimberly	SLR; DIK
Brackett, Elmer E.	DIK
Besse, Gerard C.	FRF
Bailey, Raymond L.	BST
Baum, Leland M.	BST
Boardman, Vinson R.	BST
Bacon, Benjamin S.	FRF
Black, Asa R.	FRF
Burnett, Hunter T.	FRF
Bates, John H.	DIK
Butner, John C.	FRF
Bales, Harry O.	SMM
Brennan, Charles J.	SRC
Brown, Glenn W.	SRC
Baisley, Herbert Kenneth	SLR; RSD
Baxter, Alfred Whitcomb	SLR; KST
Beindorff, Robert Wilmer	SLR; KST
Beno, Charles Bernard	SLR; KST
Bixenstein, William Frederick	SLR; KST
Broms, Clarence Selby	SLR; KST
Benjamin, Everett Farrington	SLR; LDT
Batten, Eugene Cooper	SLR; HHN
Blackburn, James Mortimer	SLR; RWT
Bradley, Leslie Kenneth	SLR; RWT
Barnett, Robert M.	FRF
Bunkley, William H.	FLR
Belt, Dean Bryan	SLR, EOT
Bennett, John Crogan	SLR, EOT
Baker, Gordon	PFO
Baker, Joseph Brimmer	SLR; EOT
Brumbach, Jefferson Upton	FRF
Bradford, William Russell	FRF

Bash, Philip Purciance	FRF
Barden, Paul Ellsworth	FRF
Buchanan, James P.	DIK
Batt, Joseph S.	Note 7
Bailey, Dan W.	FRF
Barrett, Vinton E.	FRF
Brokaw, John A.	FRF
Bissel, Paul L., Jr.	FRF
Barker, Fred V.	FRF
Blake, John R.	FRF
Balahach, Nyle J.	BST
Bailey, Louis H.	MIT
Bryan, Edward G.	DIK
Baird, Chester A.	FRF
Blount, Frederick R., Jr.	DIK
Brown, Robert A. M.	KST
Brundidge, Moses M.	KST
Brantz, Harry E.	DIK
Babcock, Harry A.	DIK
Barnes, Dwight F.	DIK

C

Cawcutt, Ernest A.	REV
Canfield, John Peters	SLR; HHN
Crowdus, Walter Cary	SLR; LDT
Coleman, Arthur Augustus	SLR; EOT
Castor, Bernard Tobias	SLR; EOT
Comstock, Asa Hurley	SLR; KST
Carter, Harry William	SLR; RSD
Crum, Harry C.	FLR
Campbell, Hayden Snelson	SLR; LDT
Conant, Rellis Gilbert	SLR; EOT
Crawford, Frank Howard	SLR; KST
Craig, Iltred William	SLR; KST
Carlile, Robert, Jr.	SLR; KST
Cort, Arthur J.	DIK
Campbell, Robert A.	FRF
Conroy, Thomas Payne	SLR; LDT
Clarke, Chester Raymond	SLR; EOT
Crede, Lloyd Stanley	SLR; EOT
Curtin, James Golden	SLR; EOT
Carpenter, Earle J.	SLR; PMT
Coates, William Thomas	SLR; RSD
Coulter, William Eliot	SLR; KST
Cowdin, John C.	FLT
Cake, Joseph P.	RTR
Curley, Harry C.	RTR
Czuleger, Charles	RTR
Clark, Franklin W.	BST
Conway, John A.	UTA
Cronau, Robert T.	FRF
Chapin, Harry T.	SLR
Clark, Walter D., Jr.	BST
Christian, John G.	FRF
Cottrell, George W.	FRF
Clement, Otis G.	KST
Crary, Allan H.	AGC
Clark, Ralph S.	TFT
Clark, Roger P.	TFT
Coleman, Wiley L.	TFT
Cole, Robert L.	FLR
Crawford, James W.	RTR
Courtney, Albert A.	RTR
Chapman, Leonard B.	AGC
Cooke, Walter Ross, Jr.	FRF
Campion, John L.	TFT
Centner, William F.	TFT
Colvin, Arthur D.	DIF
Channing, John	SMM
Crowdus, Walter C.	DIK
Carter, Edward V.	DIK
Corbitt, Marsh M.	DIK
Covington, Euclide M.	DIK
Carter, Clarence L.	CIT
Conway, John Arthur	FRF
Campbell, Alexander	FRF
Chance, Percival Henry	SLR; BFT
Caldwell, Victor B., Jr.	Note 7
Chauncey, Charles C.	FRF
Chaddock, Homer L.	DIK

D

Dewey, Robert A.	DIK
Daniels, William C.	DIK
Dana, Deane	SLR; EOT
Dawson, Charles Bertram	SLR; LDT
Du Pree, William Edmond	SLR; EOT
De Vore, Kenneth Lee	SLR; KST
D'Hodge, Wiley F.	BST
Dahringer, Homer W.	FLR
Dobbs, Silas A.	FRF
Durand, Elliott, Jr.	FLR
Dame, Ralph L.	KST
Dahl, Leighton	SGS
Duckett, Thomas P.	FRF
Dine, Herman Joseph	SLR; KST
Duncan, Lee John	SLR; GLC
Daniels, Albert James	SLR; EOT
Dowd, Harold Wallace	SLR; KST
Davis, Rowland L.	FRF
Dawson, John F.	RTR
Decker, Kenneth N.	BST
Denbe, George W.	BST
Duffy, James W., Jr.	TFT
Drinkwater, Arthur	FRF; RTR
DeLong, George I.	RTR
Dickman, W. L.	RTR
Dolan, John A.	RTR
Dyer, Clarence A.	DIK
Dunlap, Edwin W.	Note 10
Diavila, Louis Bernard	SLR; HHN
Dodge, Cecil Pillsbury	SLR; GLC
Dixon, Edwin M.	FRF
Dixon, Rollin L.	FRF
Dissette, John W.	SAG
Dana, Dean	DIK
DesChampe, James W.	DIK
D'Autremont, Hubrt H.	DIK
Dillaway, Mason M.	DIK
DeSmet, George W., Jr.	SLR; GLC

E

Erickson, Henning Lawrence	SLR; KST
Eimiller, Bert F.	RTR
Ellison, Charles E.	RTR
Ennis, George S.	RTR
Edmund, Harvey William	SLR; RSD
Eddy, Arthur E.	FRF
Edson, Albert L.	DIK
Elliott, Douglas S.	TFT
Eckstrom, Lawrence Joel	SLR; HHN
Ewing, Hugh Whitton	SLR; RSD
Ellioot, Clinton, Jr.	SLR; GLC
Ebright, Carroll M.	BST
Ellison, Howard	KST

F

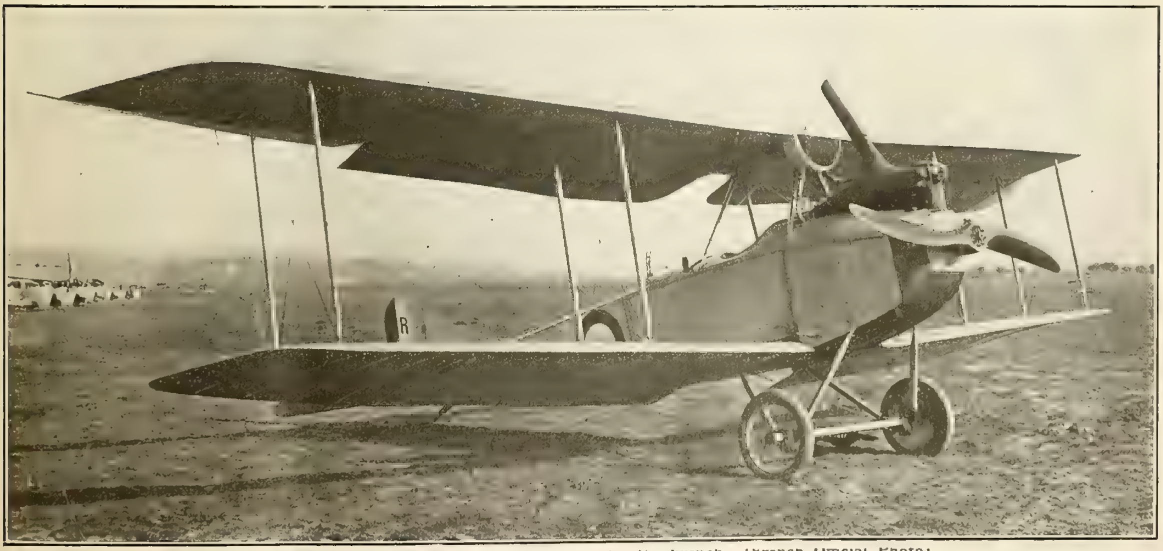
Fleming, Victor L.	SLR; CSO
Fraser, Dean Blenus	SLR; PMT
Forbes, Oliver D.	BST
Foster, Ralph F.	BST
Fisher, George V.	RTR
Frantz, Casper	RTR
Fearn, Edmund, Jr.	SLR; PUP
Fitzpatrick, William H., Jr.	FLT; LHV
Freeman, Edward Woolsey	FLR; VBW
Flesh, Alfred Louis	SLR; SAG
Farrell, Gerald J.	RTR
Finney, William S	RTR
Firestone, Allen	RTR
Foster, Lee Wood	SLR; RWT
Feltus, Russell Hodge	SLR; EOT
Ferris, James Joseph	SLR; EOT
Fitzgerald, John J.	KST
Faircloth, Edward C.	TFT
Foster, Henry B.	TFT
Farmer, Marion A.	FLR
Fuller, Wiley M.	FRF
Foreman, James A.	KST
Fox, Benedict	KST
Field, William P.	CSO
Fairfield, Edward M.	DIK
Flynn, Mortimer G.	DIK

G

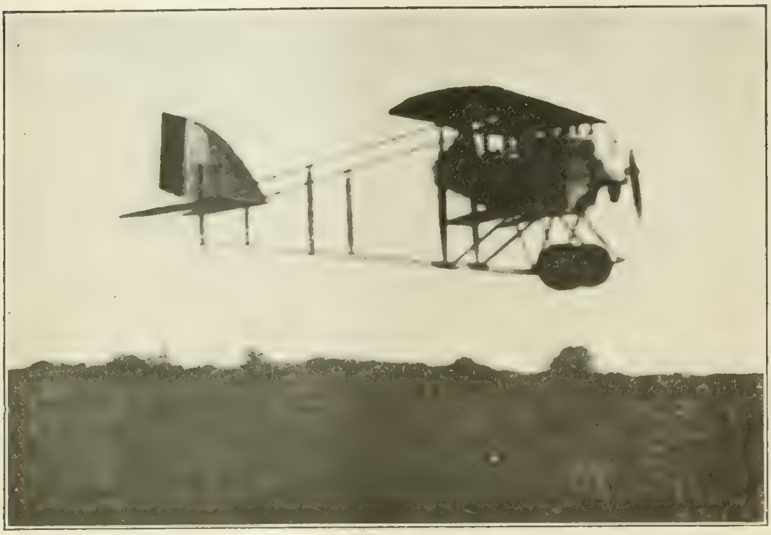
Grasse, Carl A.	FRF
Glenn, Edgar Eugene	SLR; RWT
Gill, Hamilton Arlington	SLR; LDT
Goss, Lewis William	SLR; RSD
Gagnon, Alfred	RTR
Grayson, Walter A.	RTR
Gould, DeAlton F.	RTR
Grady, William G.	RTR
Green, Guy W.	TFT
Gendron, Leon P.	DIK
Goddard, Fred C.	DIK
Gathings, James Clinton, Jr.	SLR; EOT
Grisemer, Walter	SLR; EOT
Gude, Adolph E.	BST
Guthrie, Clifford B.	BST
Garties, George	FRF
Griffith, Clyde I.	FRF
Gouy, Arthur C.	AGC
Graves, Nelson M.	FRF
Graham, William R.	AGC
Gilbert, John W.	TFT
Giles, Benjamin F.	FLR
Gill, Thomas H.	FRF
Grimes, William B.	RTR
Gaines, Edmond P.	TFT
Gilman, Harold A.	DIK
Goodstein, David Moss	SLR; DIK
Glanz, Carl C.	FRF; DIK
Gilbert, Lester F.	CSO
Gleerup, William W.	DIK
Gowans, John	DIK
Galligan, Patrick R.	KST
Garrity, George F.	KST
Gilder, Rodman	MJR
Guthier, Roy Edwin	SLR; DIK
Goode, Henry W.	DIK
Golden, William W.	KST
Gordon, Harry R.	KST
Greenwood, Levi C.	KST
Guard, James W.	FRF
Griffith, Frank L.	FRF
Geisler, Clement George	SLR

H

Honn, Laurence Claude	SLR; RSD
Harris, Carl Alvin	SLR; CWT
Halpin, John H.	DIK
Hastings, Morris Ogden	SLR; RSD
Hudson, James L.	WAC
Hall, Dudley, Jr.	WAC
Hines, Harvey F.	RTR
Hallett, George E. A.	MAJ; CSO
Hay, Wellington Burt	SLR; KST
Hassler, Paul C.	RTR
Hellman, Frank J.	RTR
Hibbard, John J.	RTR
Hoff, Fred D.	RTR
Holton, Russell G.	RTR



A Rumpler type of German machine captured by the French. (French Official Photo)



A training Caudron biplane. Note the trailing landing skid, which adds to the safety in landing for the beginner. (French Official Photo)

Hunt, Frank L	RTR
Hunt, Roy E	UTA
Hill, Glenn R	TFT
Hall, Levi M	TFT
Hoffman, Joseph K., Jr	TFT
Hind, Harry L	AGC
Hill, Maurice S	SMM
Hotaling, Harry Dawson	SLR; EOT
Hann, Ralston P	SLR; LDT
Hobbs, Edward H	FLR
Hanson, Howell R	FRF
Harding, Roy E	DIK
Helgesson, Henry T	DIK
Hodge, Glenn B	DIK
Hornig, William F	BST
Holland, Maurice	MIT
Hartman, Harry B	HHN
Helweg, Lawrence W	DIK
Hinman, David E. B	DIK
Hassett, Emmitt A	TFT
Harrison, Travis L	TFT
Harrison, Mathew	Note 8
Harrison, Elbert Iredall	SLR; DIK
Hyde, Gordon E	FRF
Houlihan, Daniel James	SLR; AAD
Hazelton, Oscar M	KST
Hulbert, Ray C	KST
Hunton, Lewis G	KST
Heine, Bernhardt E	DIK
Harrigan, Comeline H	DIK
Harrington, Henry Gilbert	SLR; DIK
Hicks, John	SLR
Hart, John Francis	SLR
Hittig, William, Jr	SLR
Horne, Ernest Grover	SLR; DIK
Hanely, Harold Robinson	SLR
Hodge, Clarence Esterly	SLR
Holmes, George Gilbreth	SLR; DIK
Hamby, William Fred	SLR; VBW
Hunt, Roy E	FRF
Hilton, William T	FRF
Harmon, Ernest E	FRF
Holladay, Daniel M	FRF
Hurd, Mark M	DIK
Hansen, George W	SRC
Ham, Mark N	DIK
Hall, James H	KST
Harvey, Otis L	KST
Hawn, Albert R	KST
Herndon, James J	KST
Harvey, Harold M	DIK
Hirshfield, Ira W	DIK
Howe, Lawrence L	DIK
Hartman, Frederick S	DIK
Huffman, Carl I	DIK
Hollingsworth, John Y	DIK

I

Inglesby, Joseph E., Jr	TFT
Isbill, Paul Martin	SLR
Ingraham, Forrest W	DIK

J

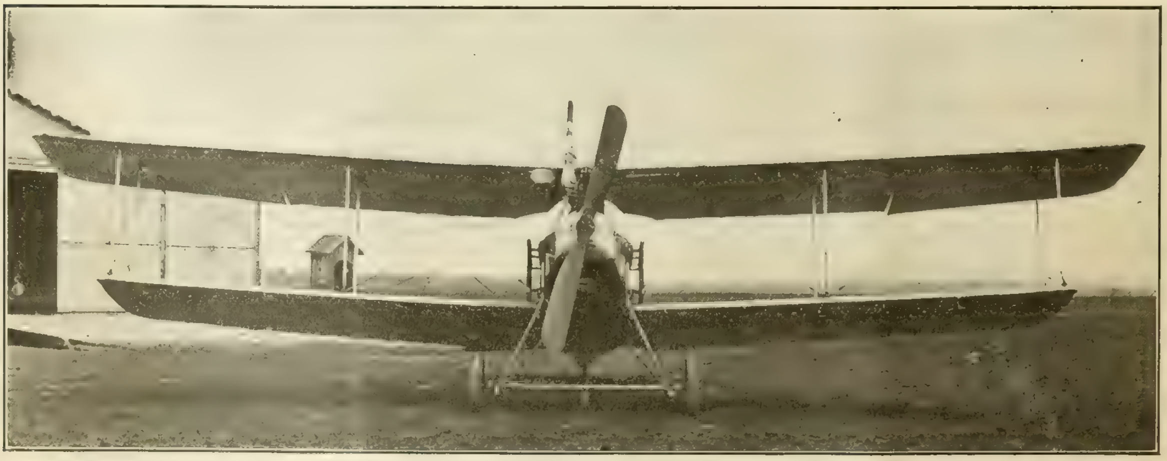
Johnson, John M	SAG
James, Van Allen	TFT
Jensen, Chris H	RTR
Judson, Henry H	RTR
Johnstone, Hugh R	DIK
Joseph, Jesse S	CIT
Johnston, Stephen B., Jr	KST
Jones, Buford H	KST
Johansen, John M	FRF
Jordan, James J	DIK
Jones, Howard T	DIK
Jessop, Richard	SLR; KST
Jamison, Ross P	DIK
Lea, Royal B	DIK
Jacobs, George S	DIK
Jarvis, Samuel G	FRF
Jones, William M	UCB

K

Kritzen, Henry Ellis	SLR; EOT
Kimball, Francis Nelson	SLR; LDT
Kultgen, John Henry	SLR; HHN
Kelley, James M., Jr	SMM
King, Harry Calvin	SLR
Kinney, Wallace Elliott	SLR
Kidder, Henry P	FRF
Kern, Edward E	FRF
Kelly, Philip J	FRF
Keeling, Walter S	DIK
Kendrick, Aaron T	FRF
Kendall, Ralph N	KST
Krick, Frank	SLR; VBW
Kilcup, Norman L	KST
Korman, Egbert J	KST
Keith, Alexander H	FLT
Kaplowitt, Mack B	FRF
Kilroe, John C	DIK
Kelcey, George G	DIK
Kultgen, John H	DIK
Kimball, Milton S	FRF
Kauffman, Cyrus S	FRF
Kerwin, William James, Jr	SLR; KST
Kirby, Harley Elmer	SLR; KST
King, Charles D	FRF
Kronig, Louis H., Jr	KST
King, Ned E	FRF
Keough, Wesley L	SAG
Kicklighter, Charles H	MIT
Kline, John R	DIK
Kelly, James M	RTR
Keeffe, Louis R	FRF
Kear, Charles E	TFT
Kober, Edgar I	TFT
Korner, Carl W	BST
Knapp, Ralph A	BST
Kelley, Harold C	DIK
Keith, Jerome	SLR; BFT
Kane, John F	RTR
Kiess, Clarence W	RTR

L

Link, Rue Showalter	SLR; CRI; FRF
Luttrell, Nathaniel H	Note 2
Larkin, George C	RTR
Lindsay, Oliver Christian	SLR
Livesay, George Byron	SLR; DIK
Lienhard, John Henry	SLR
La Prade, Ernest Maitland	SLR; RWT
Lawrence, Henry Donald	SLR; EOT
Levinson, Jesse A	REV; VBW
Longley, Francis B	MAC
Larer, George Norwood	SLR; KST
Lansing, William E	RTR
Larkin, Edward J	BST
Lucas, Ottis P	FRF
Lake, Chester H	PUP
Lewis, David E	BST
Locher, Bailey J	RTR
Lobdell, Warren L	BST
Lowry, William J	BST
Lesley, Hubert	DIK
Leech, William I	RTR
LeGrand, Lewis W	RTR
Lynch, Thomas	RTR
Lockwood, Milton K	FLR
Lane, Ray	Note 7
Lane, Herbert V	DIK
Lawrence, Dudley B	CSO
Liensech, Charles F	DIK
Landram, Harry T	KST
Lankey, Francis I	DIK
Lyle, Fred B	TFT
Lewis, Orman J	DIK



A Rumpler type of German machine captured by the French. Note the location of the radiators. (French Official Photo)

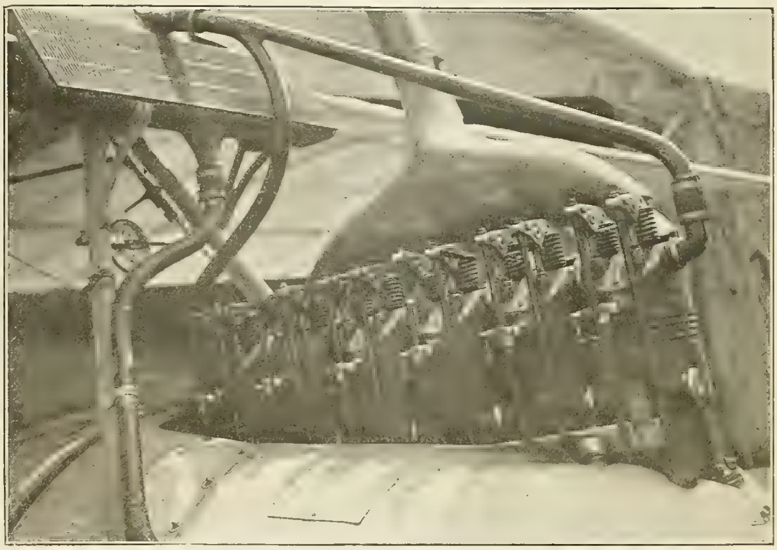
Lane, Orlando H.	DIK
Lord, Merritt M.	FRF
Ledbetter, Eugene P.	SMM
Lick, Walter E.	DIK

M

Merritt, Edward Kellogg	SLR; RSD
Montague, Harley Howard	SLR; LDT
Mackenzie, William James	SLR; CWT
Mills, Harold W.	FRF
Meyers, Marion T.	DIK
Mayer, Arthur C.	DIK
Milburn, George J.	SLR; FRF; DIK
Marvin, Arthur B.	CDT; SAG; Note 1
Mansell, Isaac Errett	SLR; LDT
Merkel, Louis Johnson	SLR; LDT; FRF
Mayhew, Harry E.	KST
Murphy, Harry Clifford	SLR; KST
Morgan, Herbert Peyton	SLR; BFT
Meers, Herbert Herman	SLR; LDT
Maloney, Herbert L.	CUI
Majors, Earl	RTR
Meredith, George W.	SMM
Madsen, Olav	RTR
Mills, Omer	RTR
Mitchell, Maurice P.	RTR
Moore, Bernard S.	RTR
Morthland, Merle Al	SLR; KST
Miller, Frank Milford	SLR; AAD
Mosher, Roy Bradford	SLR; GLC
Madison, Clinton Rice	SLR; KST
Mann, William DeFees	SLR; KST
Mead, Michael Francis	SLR; KST
Miller, James Andrew	SLR; KST
Moore, Clydus Lloyd	SLR; KST
Mildeberger, Ethan A.	KST
Millington, Harry	KST
Mousley, John L.	KST
Mook, Harold F.	BST
Moore, Marlin C.	BST
Murray, H. Sinclair	BST
Mackie, Pearle	FRF
Merrill, Charles E.	FRF
Meeks, Charles C.	TFT
Maynard, Kenyon C.	DIK
Morris, Julian B.	DIK
Monahan, John W.	FRF
Morrill, Richard C.	FRF
Markley, John Wayne	SLR; KST
Merrick, Bentley A.	FRF
Miller, Edward A.	DIK
Moore, David H.	DIK
Moore, Harold A.	DIK
Marshall, Robert J.	Note 7
Munoz, Francis M.	FRF
Martin, James Carey	SLR; EOT
Megahan, Donald Bruce	SLR; EOT
Melican, George Deady	SLR; EOT
Meadows, Asbury W.	TFT
Metzger, Carlysle L.	DIK
Murphy, Harry C.	DIK
Mooers, Edward A.	BST
Marsh, Gerald Gilbert	SLR; DIK
Mosher, Roy B.	FRF
Mollison, James Alexander	SLR
Moore, John Sutherland	SLR
Moss, Douglas Rogers	SLR
Meyer, Emil Albert	SLR; DIK
Mathews, James Christopher	SLR
Machle, Jerome Benjamin	SLR
Madden, John Henry	SLR; DIK

Mc

McCoy, Dell H.	FRF
McKay, Woodrow	FRF
MacKenzie, William J.	DIK
McCaffrey, James Augustine	SLR
McDonald, George Clement	SLR; DIK
McKenney, Samuel Mortimer	SLR; DIK
McVickar, John Bard	SLR; DIK
McKay, Edgar John Waring	SLR
MacCracken, William Patterson	SLR; RWT
McEnerny, Daniel Thomas	SLR; EOT
McCabe, Roscoe E.	DIK
McCabe, Ross	FRF
McFarland, Denman T.	FLR
McCabe, Frank M.	CPR
McKee, William B.	RTR
McLaughlin, Charles P.	RTR
McDonell, Edwin A.	SAG
McDowell, Herbert Levent	SLR; KST
McDuffie, Arthur Lattner	SLR; LDT
McAuliffe, William F.	DIK
McDonough, Hubert B.	DIK
McLaren, William B.	FRF
McCarron, Henry Albert	SLR; AAD
McWilliams, James L.	SMM
McKernon, George E.	FRF
McCormick, Ralph C.	DIK
McIntosh, Lawrence W.	FRF
McRea, Harry B.	DIK
McFalls, Edwin L.	FRF
MacEnroe, John W.	TFT
MacDougall, Kirkland B.	WAC
McCartney, Charles Edwin	SLR; LDT
McIllhiney, Donald W.	CIT


The engine mounting of the Benz in a late type of German aeroplane

N

Nietz, Adolph Hugo	SLR; LHV
Noren, Carl Albin	SLR; CRI; FRF
Nelson, Arlen Claron	SLR; RSD
Noble, Arthur Warren	SLR; KST
Naugle, Frank Sherburne	SLR; DIK
Neely, Harold R.	CRI
Nesbitt, Arthur E.	RTR
Northup, Benjamin L.	RTR
Nelson, Luther	DIK
Nethercut, William R.	FRF
Neal, Guy O.	KST
Nigh, Gordon K.	BST
Noonan, George Carroll	SLR; DIK
Neubauer, George R.	DIK
Nye, John A.	RTR
Nichols, George William	SLR; DIK

O

O'German, William S.	UTA
O'Hare, Thomas K.	DIK
O'Connor, Thomas Francis	SLR; DIK
O'Brien, James Sherry	SLR; GLC; FRF
O'Brien, William E.	RTR
O'Brien, Raymond K.	FRF
O'Neill, Harry L.	RTR
O'Dowda, John S.	FRF
Odale, Walter B.	RTR
Oviatt, Howard M.	RTR
Otis, Thomas F.	BST
Ormond, Roy B.	DIK
Oliphant, Rufus A.	DIK
Olssen, William E., Jr.	DIK
Olmstead, Charles H.	KST
Orr, Dale	SLR
Oliver, Philip Estey	SLR

P

Poste, Ellsworth	SLR; KST
Pratt, Harold Clifton	SLR; KST
Peck, Lee Hubert	SLR; GLC; FRF
Park, John Watson	SLR; GLC; FRF
Parker, Herbert Wallace	SLR; EOT
Page, John Harry	SLR; EOT
Prindle, William D.	DIK
Patton, Hilton M.	FRF
Provoost, John Croes	SLR; GLC; FRF

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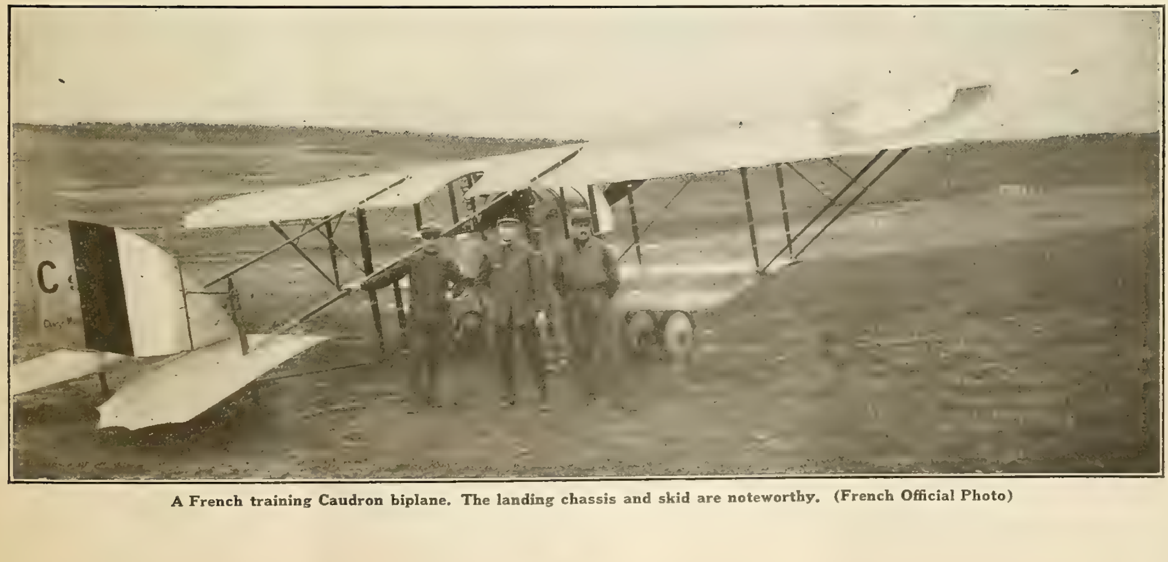

A French training Caudron biplane. The landing chassis and skid are noteworthy. (French Official Photo)

FOREIGN NEWS

BELGIUM

"Our aviation has new successes to its credit, apart from its regular duties of observing and photographing. Adjutant Domeulemester has brought down his tenth plane, Lieutenant Oliestagers his sixth, and Adjutant Coppens has destroyed his fourth German balloon," says the Belgian official announcement, made public at Washington on May 27th.

FRANCE

The official night statement given out by the French War Office on May 30th, reports great aerial activity. The text of the statement follows:

"The enemy air forces, which have been very aggressive and numerous during the battle, have been attacked with the greatest daring by French airmen, who destroyed nineteen German machines, brought down two balloons and compelled twenty-three enemy aeroplanes to land in a damaged condition.

"On the night of May 27-28 French aviators dropped twenty-three tons of explosives on bridges and crossing on the Ailette and Aisne and on various cantonments. The next night and day thirty-seven tons of bombs were dropped on convoys, troops and railway stations."

Extensive aerial operations are reported in the French official announcement of June 1st, the text of which follows:

"On May 31st aerial fighting continued along the battlefront.

"Our airmen attacked with their usual dash enemy aeroplanes, twenty-three of which were brought down and fourteen gravely damaged. Enemy captive balloons were harassed without respite, being forced frequently to make a landing. Their observation work has been considerably interfered with, and six of them were destroyed.

"Our observers have never ceased to mark out the enemy lines and send information to the commanders concerning enemy movements. They have carried out reconnaissances day and night as far as Varvins, Guise, Le Cateau, and Hirson.

"Finally, in the entire battle zone our escadrilles have employed their machine guns against German troops on the march, inflicting serious losses."

Captain De Ullin, it was announced, has won his twentieth aerial victory. The captain was a partner of the late Captain Guynemer, the French ace.

GERMANY

The German official statement issued on May 29th reports the following aerial operations:

"In spite of the changing weather, our aerial forces are attacking the enemy again and again with bombs and machine guns, while aviators have surveyed without interruption our progressing attacks and effect of our artillery fire."

Summarizing aerial activity during the first three days of the second phase of the German offensive, the official statement of May 30th reports the following:

"During the last three days our aviators have brought down thirty-eight enemy aeroplanes south of Ypres. Five enemy captive balloons were brought down in flames."

The German official statement for June 1st states that "in the last two days we have shot down thirty-six enemy aeroplanes."

GREAT BRITAIN

The official statement on aerial operations made public on May 27th says:

"Owing to low clouds and dense mist little flying was possible on Sunday until evening. Four tons of bombs were dropped on targets in the neighborhood of Armentieres and Fricourt. Six hostile machines were brought down in air fighting. None of ours is missing.

"On Monday the Bendorf railway station, in Rhenish Prussia, was bombarded. Twenty heavy projectiles were dropped and explosions were seen on the railway sidings. Our bombing machines were heavily attacked by hostile scouts. One of our machines was seen to go down under control. All the other aeroplanes returned safely."

British aerial operations are described in an official communication on May 29th as follows:

"Our aeroplanes dropped twenty-five tons of bombs during the day on hostile billets, dumps, and railways behind the enemy's lines on all parts of the British front.

"Thirteen German machines were destroyed in air fighting, and four others were brought down out of control. Five of ours are missing.

"Bombing was continued on the night of Tuesday. Five tons of bombs were dropped on various targets, including billets at Armentieres and the Valenciennes Railway Station. One of our night bombing machines failed to return.

"On Wednesday a number of long-distance day bombing machines attacked Thionville. They dropped a ton of bombs with good effect on the station and sidings. At the same time other machines bombed the railway and barracks at Metz-Sablons. In spite of hostile attacks from the air and ground all the machines returned."

Successful aerial operations by the British Air Force are recorded in the official announcement of May 28th, the text of which follows:

"Monday the weather generally was cloudy and the visibility was not good. However, a full day's work was done by our aeroplanes, both in co-operation with the artillery and in photography and bombing.

"Sixteen tons of bombs were dropped in the course of the day on various objectives, including billets between Armentieres and Lens, and the docks at Bruges.

"Fifteen German machines were destroyed and three driven down out of control.

"Two of our machines are missing.

"Monday night heavy bombs were dropped on the Zeebrugge lock and the Bruges docks. A great number of dumps and billets behind the enemy's lines also were bombed. A total weight of twenty-one tons of bombs was used in these different attacks. All the aeroplanes engaged in this work returned in safety.

"Hostile night-bombing machines have been active over our back areas. A Gotha aeroplane was forced to descend behind our lines, and its three occupants were captured.

"The same night our long-distance bombing machines were very active. They dropped between four and five tons of bombs on chemical works at Mannheim, the Landau railway station, an electric power station at Kreuzwald, and on the Metz-Sablons railway station and the Courcelles railway station. Very large explosions were caused. All our machines except one returned."

The text of the statement on aerial activity on May 30th reads:

"Low clouds and poor visibility prevented much work by our aeroplanes on Wednesday until late in the afternoon, when the weather cleared. Five German machines were brought down in air fighting and one was driven down out of control. We lost none.

"Five tons of bombs were dropped by our machines during the day on ammunition dumps and billets in the neighborhood of Armentieres and Bapaume.

"The bombing operations continued during Wednesday night, and sixteen tons of bombs were dropped on railway stations, including those at Valenciennes and Basigny, and on towns and roads behind the enemy's lines. Projectiles were also dropped on the docks at Bruges. All our machines returned."

The British official statement on aerial operations issued May 31st, reports the following activity:

"Our aeroplanes and balloons on Thursday were very active, the fine weather enabling much work to be done in co-operation with the artillery as well as in reconnaissance and photography.

"Bombing was carried out vigorously all day. Thirty-eight tons of bombs were dropped on various targets, including railways, roads, dumps and billets at Merville, Armentieres, Bapaume, Albert and Valenciennes.

"Twenty-eight German machines and two German balloons were destroyed during the day and six other hostile aeroplanes were driven down out of control."

A long, heavy aerial attack was made on Zeebrugge, Thursday night, (May 30th), and at about 1 o'clock in the morning. There was a tremendous crash, the concussion being felt by the entire neighborhood.

Flames rose high in the air, and it is supposed that a powder magazine was exploded, according to a Flushing dispatch to the "Telegraaf."

The War Office communication dealing with aviation for June 1st reports the following operations:

"Our aeroplanes and balloons on Thursday were very active, the fine weather enabling much work to be done in co-operation with the artillery, as well as in reconnaissance and photography.

"Bombing was carried out vigorously all day. Thirty-eight tons of bombs were dropped on various targets, including railways, roads, dumps and billets at Merville, Armentieres, Bapaume, Albert and Valenciennes.

"Twenty-eight German machines and two German balloons were destroyed during the day and six other hostile aeroplanes were driven down out of control."

The following communication dealing with aviation was issued June 2nd:

"There was fine weather Saturday. In air fighting twenty-one German machines were destroyed and four others disabled. Four enemy observation balloons were destroyed. Four of our machines are missing.

"We dropped twenty tons of bombs during the course of the day, successful attacks being made on the Zeebrugge Mole and the railways of Armentieres, Rozieres, Boesinghe, and Fleres. The railway at Karthaus and the Metz-Sablons Railway station also were heavily attacked by long distance machines, one of which failed to return."

An Admiralty announcement on aerial operations on May 27th, says:

"Bombing operations have been carried out against Mariakerke and Zeebrugge, where bombs were observed to fall close to the lock gates of the canal. Nearly three tons also were dropped on the Bruges docks Wednesday night. All our machines returned safely.

"In home waters numerous flights by the escort patrol and other anti-submarine duties were carried out. Submarines were sighted and attacked and enemy mines were located on several occasions.

"Our seaplanes also carried out long reconnaissances over the North Sea.

"On May 20th allied aircraft made a successful bombing attack on the Austrian naval base at Cattaro. A direct hit was obtained on barracks occupied by submarine crews and a fire was seen to break out."

ITALY

The Italian official statement for May 27th states that eight hostile aeroplanes were brought down in aerial operations.

The official communication for May 31st says:

"The aerial activity has been intense. Enemy trenches, dumps, and hutments have been bombed on the Asiago and Lavarone Plateaus. The roads loading to Gaillio, and troops and transports were attacked with machine gun fire. Three hostile aircraft were downed."

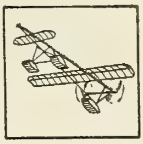
Reporting on aerial operations, the Italian War Office issued the following announcement on June 2nd:

"Italian and Allied air squadrons were very active. They dropped five tons of bombs on enemy aviation camps. Five hostile aeroplanes were brought down in air fighting, and our artillery destroyed another on the left bank of the Piave River."

Major Baracca, the leading Italian ace, has brought down his thirty-second adversary, according to a despatch from the Italian front to the Temps. He shot down the leading aeroplane of an enemy squadron.

MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

PROPELLER carving is that part of model building which the novice hates to think about. To him it is a Chinese puzzle, but there is no reason for this, because if the instructions are carefully carried out he will have little trouble in designing an efficient propeller.

We have just built a model having a 24-inch spread. We must now find the propeller for this model. Experiments show, for a single propeller flying model, the diameter should be one-third of the spread, in this case 8 inches. The pitch for a tractor must be medium, or 17 inches for this diameter.

To find the pitch of a propeller refer to Figure 8. Our propeller is 8 inches in diameter, then the tips in one revolution will travel 8 x 3.1416, or 25 inches approximately. Now the width of our blade being 1½ inches, we divide the circumference 25 inches by the width of the blades 1½ inches to find how many widths are contained in the circumference 25 inches divided by 1½ inches = 16 2/3 times, or to get even figures we will call it 17 times. Now the thickness of the blank we will use is 1 inch or for every blade width in the circumference the propeller screws its way 1 inch further into the air and by multiplying 1 inch x 17 blade widths we get 17 inches for the pitch.

The screw shown at Figure 5 will help the model builder to grasp what pitch means. We will say this screw is ⅛ inch pitch. This means, if we were to take a screw driver and give the screw one complete turn in the wood, it would advance ⅛ inch, so the propeller in one turn or revolution advances 17 inches. The model maker will remember this method of calculation is only approximate, but it is accurate enough for a model propeller. To figure the pitch of a propeller accurately it would necessitate a great deal of mathematical operations and we would have to calculate the pitch every half inch or so along the blade. The method, I have just outlined can be applied to any size of propeller by using the formula

$$\frac{\text{diam.} \times 3.1416}{\text{width of blade}} \times \text{Thickness of blank.}$$

Now that we know how to find the pitch, we will proceed to carve the propeller. We will select a block of white pine 10 inches long, 4 inches wide and 1 inch thick. This will give us ample space to work in. We next draw a line accurately in the centre of the block as a guide. Now draw lines on each side of this centre line 1½ inch from it. Then mark a point exactly half way from top and bottom of block or in this case 5 inches from the top. Now draw a line across the block at this point. Next lay off points on the two side lines 1½ inches from the cross line, now draw a line through the centre connecting the two points, we just laid out. Draw ovals around the centre point to mark out the hub, then make circles at the ends of blades to round off the tips, after which round off corners as shown.

Blank can be cut out by jig saw by following the outside lines or if you cannot procure a jig saw, carve out with a sharp pen knife.

To carve, hold blank firmly in left hand and shave off opposite blade with sharp pen knife, then give blade a sort of cupped shape. To finish use a rough sand paper. Polish off with fine sand paper. Now repeat the performance with the other blade. When this is done, turn blank over and carve the back of the blades. Be careful not to shave off too much, because there is danger of the blade of the knife cutting through the soft wood. When finished give it three coats of shellac varnish, allowing each coat to dry thoroughly before applying the other. When shellac is dry, drill a small hole in the hub, for the propeller shaft and put into place on the model.

Don't be discouraged if your first propeller doesn't come up to your expectations. It takes a little practise to do a good job. My first propeller was no credit to me, one blade had a greater pitch than the other, but it flew an Antoinette model 75 feet when the model record was 178 feet. So you see a model propeller will give some thrust even when made incorrectly, but of course the better workmanship always gives the best results.

The motive power to turn this size propeller consisst of 10 strands of ⅛ inch rubber.

Some experienced model builders prefer a propeller built up of two pieces of thin birch veneer, cut to shape and then bent over a flame, by twisting until the proper shape is accomplished. Lapped at the hubs and wrapped with thread and glue. See sketch.

"Slim" Ahrens Still Active

"Slim" Ahrens, who will be remembered as an old Illinois Model Club Flyer, is with the L. W. F. Co. at Central Park, L. I., flying field. He is about to build another light tractor and do some joy hopping in his spare time. "Slim" says he'll know how to fly by the time he finishes his next machine, even if he has to pay for it.

Every time "Slim" goes up he has a tendency to cut down telegraph poles and obstacles that get in his way.

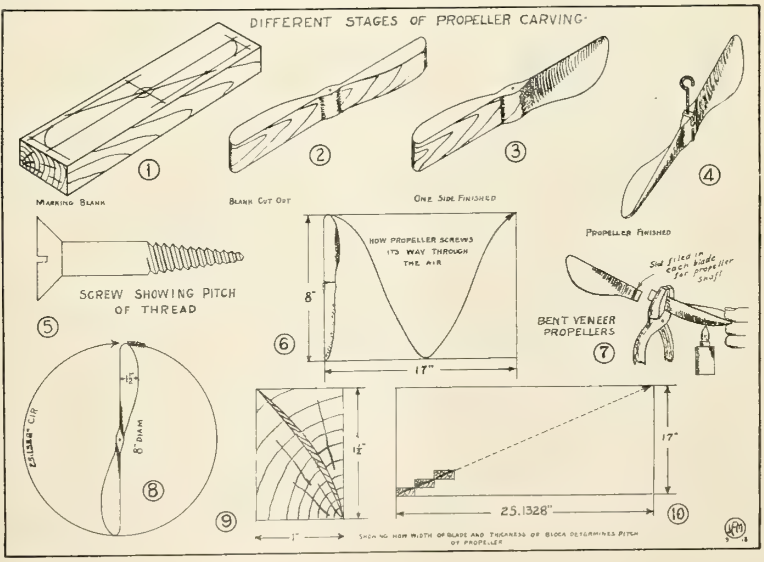
"Slim" has a good knowledge of light H. P. machines and he has promised to publish some of his valuable "dope" on this page at an early date.

"Junior Aeronautical Reserve"

The Correspondence Model Aero Club, of Babylon, wishes all model flyers who would like to become "Junior Aeronautical Reserve" members to communicate with the Membership Secretary, Edwin A. Jenkins, No. 1141 Bushwick Avenue, Brooklyn, N. Y., who will be glad to give advice and help in this matter.

This club is the first to start this good work and every school boy and young man should get in line for the summer campaign.

Method of finding the pitch of a propeller, also proper method for laying out propeller blank


DIFFERENT STAGES OF PROPELLER CARVING·
①
Marking Blank
②
Blank Cut Out
③
One Side Finished
④
Propeller Finished
SCREW SHOWING PITCH OF THREAD
⑤
8"
HOW PROPELLER SCREWS ITS WAY THROUGH THE AIR
17"
⑥
Slot filed in each blade for propeller shaft
BENT VENEER PROPELLERS
⑦
1½"
25.1328" CIR
8" DIAM
⑧
⑨
1½"
1"
17"
25.1328"
⑩
Showing how width of blade and thickness of block determines pitch of propeller
JFM

INDUSTRIAL DEPARTMENT

NEW ORLEANS IN AVIATION

By **HOWARD EGLESTON**, Manager New Orleans Association of Commerce

NEW ORLEANS has made a start in the aeroplane industry and if the hopes and beliefs of those managing the Richardson Tandum Biplane are realized, as it appears probable they will be, it is sure to become one of the great centers of this industry. With great level plains surrounding the city on which alighting fields can be located, a lake twenty-five miles wide by forty miles long to fly over, equable climates, rare high winds. (In the last forty-three years New Orleans has had only three storms in which the wind reached a velocity of sixty miles or over. In the period 1879 to 1916, thirty-seven years, Pensacola has had thirty storms in which the wind reached a velocity of sixty miles, and during practically similar periods, Galveston has had sixteen and Jacksonville nine storms of these high velocity of winds.) It would seem, therefore that of all similar locations, New Orleans was the best place for practice or trial flights.

Of materials required, we are in the center of production of cypress and number among our mercantile establishments the largest importers of mahogany in the country.

New Orleans has a large number of skilled cabinet-makers who can be very useful in aeroplane factories, and foundries for iron, steel and brass castings and machine shops capable of handling any size of work.

The "Industrial Canal," which has just been financed, will furnish ideal sites for the manufacture of hydroplanes or land planes. Housing facilities are ample for the present and can be easily increased as demand requires, for there are large areas already provided with sewers, water, gas, electric light and transportation, where dwellings can and will be erected as soon as needed.

The Association of Commerce, through its Industrial Bureau, stands ready to render any assistance that may be desired by persons interested in our city.

AERIAL INDUSTRIAL POSSIBILITIES AT MADISON—THE INLAND WATERFRONT CITY

By **DON E. MOWRY**, General Secretary, Madison Association of Commerce

FOR hydroaeroplanes and flying boat manufacturing and development Madison—the inland waterfront city—Wisconsin, offers exceptional possibilities.

Literally speaking, there are acres of water available for trials and tests. Madison is situated on an isthmus, half a mile or more in width, between two of her four lakes from which she derives her city slogan—"The Four Lake City." The largest lake—Mendota—has a stretch of seven miles, with a circumference of twenty-five miles. The next largest lake—Monona—has a circumference of twelve miles and a running distance of over three miles.

Since the world war began, Madison has had exceptional industrial growth. In 1914 ten of her principal manufacturing establishments employed in the neighborhood of 900 men, while in 1917 these same industries employed 3,000 men; and they estimate that in 1918 they will employ 4,000 men. Within a radius of forty miles of Madison in all directions, there is a population of 265,000 people, while within what is known as the "Madison Trade Zone," comprising the counties of southern Wisconsin, the richest section of the State, there are 475,000 people. It is estimated that the present industrial population is approximately 5,250 people. Comparing these estimated figures with the industrial population of 1910, it is quite evident that Madison is growing industrially, because at that time there were about 3,000 people employed in labor.

Since the war began two Government ordnance plants have been located in this city, each of which has contracts calling for several million dollars' worth of finished products. One of these ordnance companies is working directly under the direction of the Army and the other under the direction of the Navy.

Madison may be said to rival, although to a lesser degree, Cincinnati as a machine tool center. The Gisholt lathe, as well as the Steinle turret or full swing lathe, is world-famous. The demand for aircraft lines has created a call for a class of equipment that exceeds to a marked and decidedly noticeable degree any similar demands which followed the booms resulting from bicycle and automobile development. The recent demands, caused

View of Forest Products Laboratory At Madison, Showing Storage Yards

largely by the war, have, therefore, demanded machinery requirements for this type of manufacturing, which are not only enormous but exceedingly exacting.

The nature of aircraft needs demand three cardinal features in the power unit: (1) Great power within a small space; (2) Minimum weight and positive security of successful operation. This combination requires (given a good design) (3) Extremely accurate workmanship as well as the highest grade of materials. The workmanship requires a degree of skill never before attempted in the manufacture of gasoline motors for any class of service. Absolutely smooth surfaces and exact duplication of sizes are required in cylinder bores and all chambers and passages, in which combustion takes place or its action effects. In addition, extreme accuracy and interchangeability of all parts of a strictly mechanical nature is of prime importance in order that perfect balance of operation may be insured in duplicate members of the unit.

When these requirements have been assured, there is one other requisite, namely, rapid and quantity production. When one considers the number of Liberty aeroplanes being built and the fact that each one has an engine or motor made up of twelve or more cylinders, in addition to all other parts, the problem becomes the more intricate. The machining of these cylinders, which are made from steel forgings, is in itself an interesting and highly technical process. There is at once a call for exceptionally heavy, powerful, rugged machine tools, capable of producing the very finest class of work. There is likewise a call for a class of tooling equipment which taxes the ingenuity of the tool designer and the qualities of the tool maker.

The accompanying illustration shows a Madison-made product. The Steinle 24 inch Full Swing Side Carriage Turret Lathe is equipped with tools for boring, doming and recessing cylinders for aeroplane cylinders and for turning the crank case insert on these cylinders at the same time that the other operations are going on. A cylinder is shown mounted in the machine and two cylinder forgings are also shown on the floor in front of the machine. This machine will perform the operations indicated above on a cylinder forging in thirty minutes easily and in an exceptionally accurate manner. One machine will, therefore, turn out fourty-four cylinders in twenty-two hours, or enough for three and one-third twelve cylinder motors. It might be interesting to know that this company has furnished many large installations of this character. One of them numbers twenty machines which, on the basis just indicated, would turn out cylinders for approximately sixty-one twelve cylinder motors per twenty-two hour day.

While the machine shown in the illustration was not originally designed for this work and is used very extensively in general industrial service, railroad work, in turning out projectiles, gun carriage parts and other munitions' work, it gives evidence of the fact that Madison machine tool makers are in the front rank in tool development, are equipped to make new designs to fit the changing needs of the aeroplane industry, and concerns like the Steinle Turret Machine Company must be recognized as pioneers in furnishing the equipment for machining Liberty motor cylinders—demanding exacting requirements.

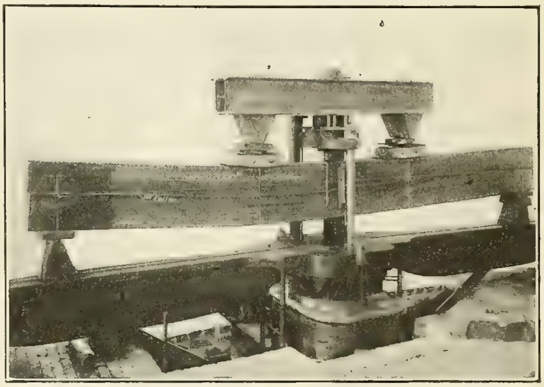
A newer and smaller concern, manufacturing the Olson Cylinder Grinding machines, the E. A. Fuller Sales Company, is not only making machines to grind automobile engines, but these machines are well suited for aviation motor work, and at the present time are being used by the French Government for that purpose. The Olson grinder is a simply constructed, easily operated machine. It is suitable for grinding cylinders from 2⅜ inch bore up to 6 inch bore.

Another important asset in the development of aeroplanes is the convenience of a laboratory. The C. F. Burgess Laboratories of Madison, Chemical Engineers, have and are conducting important investigations in the dry battery industry. It has always been contended by this company, which operates the Burgess Battery Co., that the field of dry battery uses was only touched upon the surface and that new uses would be found for them. This belief has been shown to be true, as dry batteries are being used more and more in new signal and lighting devices. The army field telephone sets, wireless sets, portable lights, etc., are equipped with dry cells of various types and the Burgess Battery Company has been co-operating with army engineers on new high capacity batteries.

There is likewise located in the city the French Battery and Carbon Company, manufacturers of commercial batteries. These two companies are probably the best equipped dry battery concerns in the country, and a mass of test data and information to help in the design of new types of battery is available. Any problems concerning battery ignition, radio signalling and aeroplane lighting and signals can be worked out here in Madison probably better than in any other place in the country, and the Burgess Battery Company, through the C. F. Burgess Latoratories, stands ready to offer its services.

Because Madison is an inland waterfront city, and has given no little attention to the subject of aquatics, there are likewise available skilled workmen, employed by the Madison Tent and Awning Company and the John Gallagher Company, who have knowledge of the materials which are used in the construction of aeroplane wings, etc. At the University of Wisconsin many experiments have been conducted with aeroplanes and hydroplanes.

Like any branch of engineering, aeronautic engineering is based largely upon principles common to all branches—and yet—some phases of aeronautic engineering are peculiar to that branch. The Engineering College of the University of Wisconsin, located in Madison, is fully prepared to give training in the common basal subjects, and is developing the special subjects, so that even now students of engineering may specialize in aeronautic engineering.

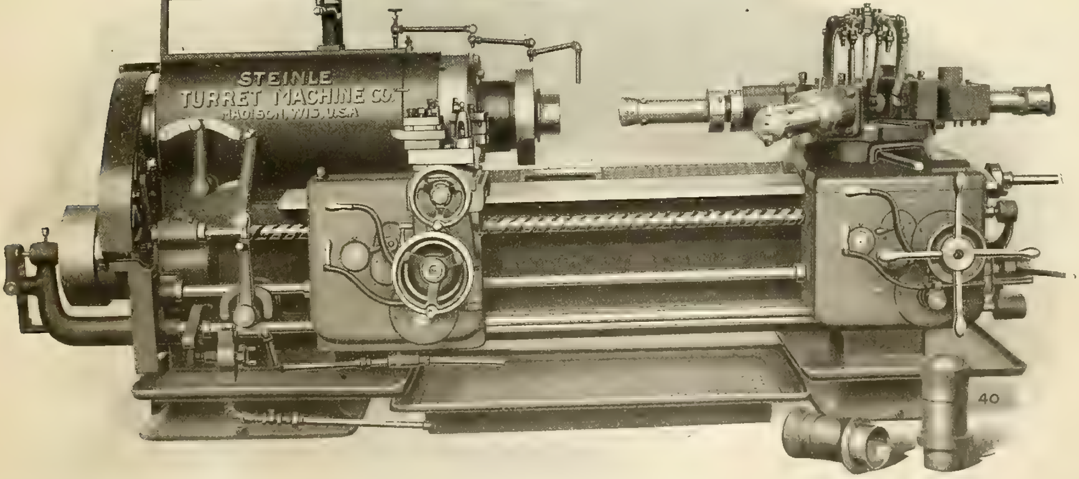


Method Employed in Testing Large Timbers. Upwards of 200,000 Tests Have Been Made on American Woods in Madison

Among the laboratories of the College, whose equipment is especially adapted for work in the aeronautic field, are the mechanical laboratory and the materials testing laboratory. The first contains automobile and aviation engines of many kinds, all available for instruction and experimental purposes. The second contains a full complement of testing machines so that strength tests of any and all parts of aircraft can be made there. These facilities are an asset which should not be overlooked by those who are looking for aerial industrial possibilities in the middle west.

Instruction in aeronautics has been given during the past two years in the Engineering College. Professor E. R. Maurer planned the course

(*Continued on page* 646)



The Steinle 24" Full Swing Side Carriage Turret Lathe Equipped with Tools for Boring, Domeing and Recessing Cylinders for Airplane Cylinders. (Two Cylinder Forgings Shown On Floor in Front of Machine.)

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Ruthless Rhymes

Whilst chasing Huns upon his Camel,
The Sopwith kind, and not the mammal
Reggie over-did a bank.
His head quite spoilt the petrol tank.

Fritz, upon his Gotha Raider,
London for a bee-line made-a;
Empty now is Fritz's garage.
Have you seen our A. A. barrage?

It took young Clarence just a week
His aircraft park in France to seek,
For, fitting out his Martinsyde,
They did not put a chart inside.

Horace on a B.E. 2 c.
Eloped one night with cousin Lucy;
He did not wed that daring wench.
They landed in a German trench!

Searchlights

The searchlights sweep the sombre skies,—
Slow-wheeling,—focussed here and there,
To catch the lurking treacheries
Within their wide-flung whirling snare;
And when they find the hidden foe
The eager hunters lay him low.

God's mightier beams are searching out
The Soul of Life and lighting it,
That His fair hosts may put to rout
The foes that have been blighting it;
Sweep clean, O Lord, and beautify,
And come Thou in and occupy!

A Romance

"Litely she tript along the streat in the direction of home and bliss and brekfast, carrying an eg in won and and a slab of baykon in the uther, when the villan of this romans slipt out of a doorway and nearly tript her up.

"Rotter!" she cried.

"Will yew be mine?" he snarled.

"No! Go home!"

"To the casule ward? Bah! Will yew marry me?"

"Whot! A rotter like you! Puff!"

"Ah!" he sied, skweezing her and, "'Ow devign!"

Partly becose she loathed the man, and partly becose the and he skweezed contained the eg, and did it no good, the bewtyus made agane cald him a rotter.

"I feel as if I am tredding on air" he said.

"Villan!" she hist. "Yew are tredding on my fut!"

"Kiss me!"

"Go and eat coke!"

"Kiss me, womon, or yew die!"

"Then I suppose I must die wether or not," she sed, desparingly. "Here goes!"

She kist him; but—

Twoz the Kiss of Kontemt!

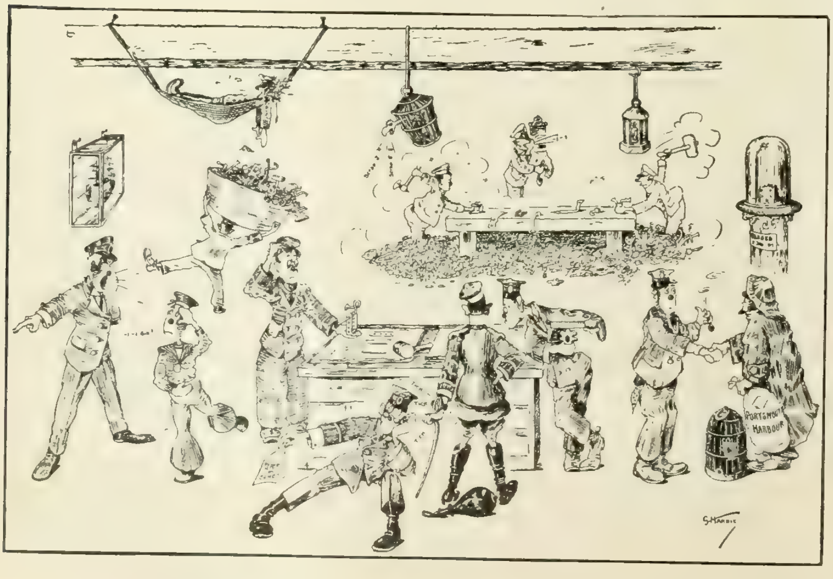
(Anuther fine romans next month!—Author.)

[Per-haps!—Editor.]

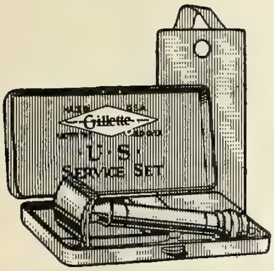
Scenes in an Aircraft Factory: In the accompanying cartoon in the immediate foreground a bomb-expert is deeply concerned regarding the intentions of a bomb carelessly left on the ground, and is apparently misled by the ticking of the watch of the active-service pilot behind him, whose combination of ultra-military uniform with Naval rank-stripes, stamps him as having been employed on land-going aeroplanes abroad. He, in turn, is interested in the efforts of two examiners to reconcile certain fittings with the drawings, the gentleman on the left being particularly puzzled as to how a fair-lead should pass through a bolt-hole.

On the right, a warrant-officer inspector greets respectfully (as shown by his removing his pipe) a deep-sea pilot who has apparently just returned from Portsmouth with his pet spare part in a cage. Behind them, enshrined in glass, is the first fitting successfully got past inspection by the firm, and inscribed "3 Jan., 1915." Judging by the destruction of "dud" fittings in the background, it appears to have been about the last also, for the department's pet parrot has picked up the cry of "Scrap it!"

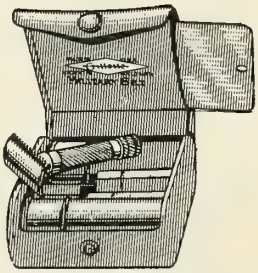
Level with the parrot, the "watch below" is taking a well-earned rest. Below him, a viewer with a correct nautical roll is taking more fittings for inspection. The proper nautical atmosphere is preserved by the glass-cased model of a ship on the left wall, and by the use of the Naval method of whispering orders, and of receiving them, as illustrated by the officer and man on the left. The telephonist in the extreme background also replies, "I—I—Sir," in Navy fashion. These customs prevent degeneration into mere lands-men by personnel employed on production work ashore.



Gillette SAFETY RAZOR



The New U. S. Service Set—A solid metal case, heavy nickel-plated and embossed with the Insignia of the U. S. Army and Navy. Strong, thin, compact: 1⅞ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box. Indestructible Trench Mirror inside the lid. $5



Military Set, No. 18—For Uncle Sam's Officers, a Gillette Combination Set, in case of U. S. Regulation Khaki twill—nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges). $7

The men who shave near the big guns

Soon or late they all come to the Gillette—the razor that has proved itself in service everywhere, on land or sea. Whether it's in the billets back of the lines or on a ship under way—the Gillette is delivering the "once over" velvet smooth shave to millions of fighting men.

Have you seen the new Gillette sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette organization in the Service—men who know what the fighting man is up against.

Simple and compact, fit the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready. No Stropping—no Honing. When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen, or Y. M. C. A. Hut, here in America or overseas.

Our Paris Office carries stocks—is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy and the Eastern battle fronts.

Gillette Safety Razor Co.
of Canada, Ltd.
73 St. Alexander St.
Montreal

Gillette Safety Razor Societe
Anonyme
17 Bis, Rue La Boetie
Paris, France

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Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in—that's essential with any shave

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(*Continued from page* 643)

especially for students of engineering, but, mainly on account of the war, interest in the subject has extended to non-technical students of the University of Wisconsin. At the present time about half of the membership of the class in aeronautics is non-technical. After the war it is safe to assume that a considerable portion of the general interest will subside and the subject will engage the attention of engineering students in the main. It is this class of students that the authorities are keeping in mind in the future extension and development of instruction in aeronautic engineering.

"Wood is to the aeroplane what bone is to the body," says C. P. Winslow, director of the Forest Products Laboratory. "Conditions arising out of this new use of wood have opened up a rather virgin field for technical investigation, and the importance of wood in our aircraft program has attached corresponding importance to wood technology in the field of science."

Wing beams and struts require a wood that is strong and stiff for its weight. Experiments and experiments show Sitka spruce to be best suited of all woods for the purpose. Ash is favored for longerons because of its bending properties and shock-resisting ability. Walnut and mahogany are used most extensively for propellers because of their stiffness and they retain their shape well.

Prior to our entrance into the war only air-seasoned lumber was accepted for aeroplane construction. It requires from one to three years, depending upon the size and species, to air-season this stock, and, obviously more rapid methods, that is, artificial seasoning was resorted to as soon as it could be shown that artificial seasoning was practicable. Kiln drying has made it possible to season stock in 15 to 40 days.

An aeroplane contains roughly 200 board feet of select lumber, but to get one thousand feet of such lumber requires the cutting of about 10,000 board feet. To build 25,000 aeroplanes would then require a lumber cut of some 250,000,000 feet. There is insufficient spruce available for such a large program and the tendency is to turn to the development of substitutes, and a similar course is being followed as regards the woods for other parts. This requires special knowledge of the physical and mechanical properties of each species, that is, comparative weights, tendency to shrink and warp, stiffness, resilience, etc., also the nature and effect of defects some of which can only be detected by an experienced eye.

Wood still holds first place in the construction of aeroplane propellers, and the propeller has the shortest life of any part of the machine. Many failures can be attributed directly to the effect of moisture. Moisture may get into the different laminations and cause unequal swelling with resulting internal stresses, or it may weaken the adhesive holding the laminations. It becomes very necessary to provide means of obviating such difficulties by the use of proper adhesives and by proper protections against moisture changes.

New tests must be devised for propeller woods to more nearly approximate actual conditions than would be the case with the usual methods of test. Greater care must be exercised in matching the several pieces entering into a single part, and this requires an exact knowledge of the relation between such factors as density and shrinkage.

There is a constant effort at improvement in aeroplane design. The aim is for the adjustment of each part to the exact service it performs, to secure strength with least weight and least resistance, or speed without sacrificing safety. Special members are being designed and different types of construction, all requiring scientific study of the raw material, wood, and methods of preparing it.

Madison can almost be called the world center of investigations in wood technology, by reason of the Forest Products Laboratory being located here. It is a Government institution maintained by the Forest Service, United States Department of Agriculture, in co-operation with the University of Wisconsin. Established in 1910 it was the first laboratory of its kind in the world and probably nowhere else is there available such a fund of information on wood of immediate value to the aircraft manufacturer as will be found at Madison. Upwards of 200,000 tests have been made on American woods, including practically all commercial species. The laboratory employs over 150 people. About half of these are technical men, and at present activities are all devoted to national defense work. Equipment is of semi-commercial size and is adequate for all kinds of strength tests on wood aeroplane parts, for tests of glues and finishes, for tests on kiln drying or the conditioning of wood, and for developing improved design.

The work upon the building and construction of aeroplanes seems to lie along the lines of mechanical engineering rather than along those of physics, although the department of physics of the University of Wisconsin is doing investigative work of the greatest service to the country in the undivided attention which Professor C. E. Mendenhall, now in Washington, is giving to the uses, construction and adaption of scientific instruments to aeroplane service. This includes instruments of many different kinds and purposes, including the problem of sending and receiving wireless messages, height estimations, the whole problem of aeroplane photography, and many other features, some of which are new and others of which are being improved by the splendid work which Professor Mendenhall is doing.

The future development of aeroplane service involves not only the investigation and estimation of the stresses and strains in the various parts of the aeroplane itself but of the different problems of the balance of the vanes or wings under the action of the wind and the elevating or lifting power which these have, depending upon the shape and inclination of the wing itself. A determination of these problems would necessitate the establishment of what is known as a "wind tunnel," in which reduced size models of the aeroplanes and of their wings are mounted and air driven past them to determine the proper curves and the proper angles of elevation. The University of Wisconsin is not, at the present time, equipped with such a wind tunnel, but it is quite likely that one may be established if this action is found necessary. There are eight or ten such tunnels in the United States at this writing and I think it has been felt that these are able to solve the problems that present themselves in this part of the study of aeroplanes.

Industrial manufacturers, who are contemplating the location of an aeronautic industry in the Middle West, should not overlook the important natural and man-made assets which Madison offers to this industry. Some time ago there was prepared by the Industrial Committee of Madison's commercial organization the why and how of a $200,000 industrial fund, and this plan of aid for substantial industrial development is ready to be put in operation. Madison believes that cities that are to hold their own must organize to fight as a unit in the struggle for industrial existence and all that that existence implies. Professional and business men of Madison stand ready to organize to do their part in fostering industrial enterprises if constructive industrial expansion is the result. The plans of other cities have been investigated and a credit guarantee and security investment plan has been evolved. The object of this plan is to provide a means of assisting industries and to do away with the old method of soliciting personal subscriptions to capital stock or bonds, without sufficient investigation on the part

(*Continued on page* 649)

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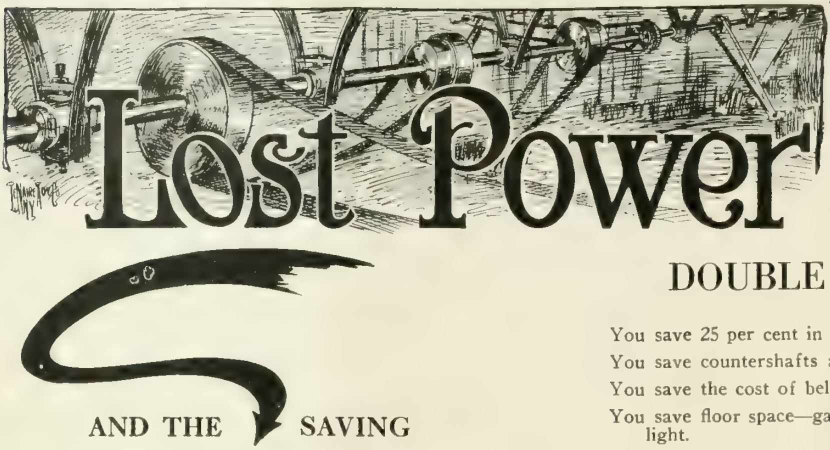

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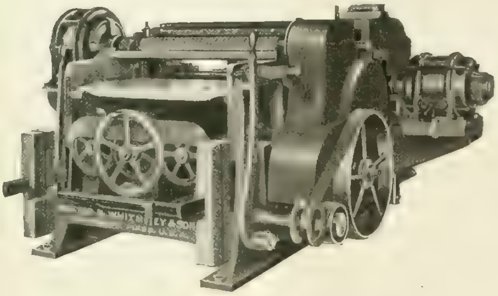

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Joseph A. Steinmetz Addresses Philadelphia Business Club

Philadelphia, Pa.—Mr. Joseph A. Steinmetz, president of the Aero Club of Pennsylvania, in an address before the City Business Club of Philadelphia at Hotel Adelphia, urged his hearers to use the new aerial mail service for writing to the boys at the front. This will not only serve to encourage the extension of the aerial mail lines, but will assure our soldiers that our air forces are being built up. Mail sent by this means, he said, will receive preference in France, and thus will be greatly expedited in delivery.

Aviation Camp On Belmont's Farm On Long Island

New York City, June 3rd.—An aviation field for the training of fifty cadets at a time will be constructed immediately on 150 acres of Major August Belmont's Nursery Farm, two miles north of Babylon, L. I. It was announced that Major Belmont, who is in the Aviation Service, signed the lease with the War Department Friday in Washington. The consideration is $1 a year. The lease is for one year, with the privilege of renewal.

Erection of hangars and preparation of quarters for the students will start within a few days, it is said. No information concerning the name of the field nor its commander has been received. Included in the land leased is the Belmont one-mile training track.

(Continued from page 646)

of the investigators. This plan substitutes for this haphazard method used in the past, a fund of credit and cash, always available for immediate use, for the legitimate assistance of concerns needing the assistance, and providing the machinery in the shape of a board of experienced and competent men to make thorough investigations, such as cannot be made ordinarily by the average investigator.

Madison will welcome and aid those industries which, upon investigation, are found to need the raw materials which this center offers and which will enter into the plan of development as laid down by the Industrial Committee of the Association of Commerce.

After analysis and study covering a period of four years, it is the general verdict that Madison offers the greatest opportunity for industrial development along machine tool lines. In the development of aeroplane motors, machine shops, batteries, technical engineers, a forest products' laboratory, and the ability to develop machines to fit the needs are assets which Madison possesses. The fact that Madison is an inland waterfront city, at the same time having acres of water as experimental and testing grounds, is another asset from the aeronautic standpoint. From the standpoint of transportation, Madison is a hub with nine lines of railroads radiating out of the city like the spokes of a wheel. More places can be reached from Madison by railroad in twenty-four hours than can be reached from any other point in the State, including Milwaukee. Madison's unusual railroad facilities and its increased motive power should induce the investment of capital along manufacturing lines.

When the Government is training every nerve to expedite the production of its aerial program, every moment is of vital importance to the manufacturer. Madison stands ready to offer her facilities in pushing forward this program at a time when patriotic service is so essential to the nation and to our cause. Plants which are now employed in the production of other products will be converted to the production of essentials demanded in aerial development. Upon request, an analysis, technical and in detail, will be made for those who contemplate the expansion of this, our most important and vital industry.

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(*Continued from page* 627)

the first order. Recently, during the same flight, he burned an enemy observation balloon and destroyed an enemy aeroplane."

Another fine citation reads: "Houston Woodward, a corporal of the Foreign Legion and flying with a French squadron, a chasing pilot; daring even to temerity and always stubbornly seeking the enemy. On January 6th, 1918, he destroyed an enemy aeroplane far within the German lines and disappeared during a combat with several enemy aeroplanes."

Captain Charles John Biddle of Philadelphia, now lying in a hospital wounded, is mentioned thus: "A captain pilot with the Lafayette Squadron, remarkable as an officer and pilot, he succeeded recently in shooting down an enemy aeroplane."

Lieuteant Paul Frank Baer of Mobile, Ala., one of America's leading aces, is cited as follows:

"A lieutenant pilot with the Lafayette Squadron, a pilot of the very first order, distinguishing himself ceaselessly by his daring. In the space of four days he succeeded in destroying two enemy aeroplanes."

Baer is now reported to be missing and is probably a prisoner.

Lieutenant Charles Herbert Wilcox of Pasedena, Cal., has this citation:

"A lieutenant pilot with a French squadron, remarkable for his daring and enthusiasm; has destroyed a German aeroplane."

The Associated Press dispatch describing aerial operations says that Lieutenant Edward Rickenbacher, the former automobile racing driver, brought down his fifth opponent, making him an ace. Single handed Rickenbacher attacked two Albatross biplanes and three monoplanes. After he had fired a hundred rounds into one of the biplanes, it fell crashing to the ground. Returning from this combat, Rickenbacher suddenly saw four German aeroplanes flying toward him. Above him was Lieutenant Meissner attacking one of the hostile machines, when another German machine turned suddenly against Meissner. Meissner's machine collided with one of the enemy and a wing of the American's aeroplane was torn. Meissner immediately turned toward home, when a third enemy machine made for him. Rickenbacher fortunately was able to come to Meissner's assistance, and the two returned to the hangar safely.

The Associated Press reports great aerial activity on May 30th and frequent aerial battles over the Toul front. The Germans are reported to have bombed an American hospital far in back of the lines, resulting in the death of French nurses. The attack was described as deliberate, the Germans using flares to insure accurate placing of their bombs on the buildings bearing the Red Cross.

An American aviator was captured by the Germans on May 30th after his machine had fallen into No Man's Land.

May 31st

General Pershing's official communique says that "Early in the day our aviators shot down a hostile machine."

To Lieutenant Douglas Campbell goes the honor of being the first American trained aviator to be officially credited with five victories. Lieutenant Rickenbacher, who has downed five planes, is awaiting official confirmation of his victory of May 30th, in order that he may also be classed as an ace.

Lieutenant Meissner has been awarded a French War Cross for downing his first opponent. The fight took place at an altitude of 15,0000 feet.

An Associated Press dispatched dated May 31st states that in addition to the two aerial victories reported for May 30th, it is reported that two more German planes were downed over the American front.

It has been confirmed that the aviator captured by the Germans after landing in No Man's Land is Lieutenant Wilfred V. Casgrain, of Detroit, Mich.

June 1st

Reporting on operations on the American front on June 1st, General Pershing's official communique says:

"The enemy aeroplane referred to as brought down in the communique of May 31st was an Albatross biplane, shot down at 1,500 metres by Lieutenant Douglas Campbell in the region of Toul. Both pilot and observer were killed."

A supplementary night statement says that "our aviators shot down a hostile machine."

June 2nd

During a flight Sunday afternoon between four American planes and six German planes north of Toul, one of the American pilots shot down an enemy biplane. One of the attacking American planes was downed. Aside from this encounter, the Associated Press states that little other aerial activity occurred.

Adjutant Edwin C. Parsons, of the Cigognes Escadrille and formerly of the Lafayette Escadrille, has downed his fifth German plane, according to information received by his father.

Sergeant L. Baylies, of New Bedford, Mass., was cited for a first lieutenancy in the French army aviation service and awarded the decoration of the Legion of Honor. The official compilation credits Sergeant Baylies with bringing down eleven German machines.

Captain Charles J. Biddle, of Philadelphia, an American aviator and formerly of the Lafayette Escadrille, is named in the casualty list of June 2nd as having been wounded in an aerial combat.

To Make Camp Greene Great Aviation Centre

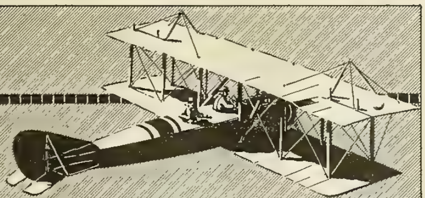
Washington, D. C., June 1st.—Secretary Baker announced that Camp Greene, Charlotte, N. C., would be made a great aviation concentration camp, at which about 15,000 men will be assembled. The remount depot at the camp will be moved elsewhere. No commanding officer for the camp has been assigned.

Lieutenant Spencer Owens Shotter, of Savannah, Ga., aviator in the Signal Reserve Corps, married Miss Marion Townsend, of New York City.

Katherine Stinson Finishes Mail Flight

Sheepshead Bay, N. Y.—Miss Katherine Stinson, who started from Chicago on May 23rd with mail for New York, arrived on June 1st at Sheepshead Bay Race Track in the midst of the Harkness Trophy Race. The first lap of her journey—from Chicago to Binghamton—was a non-stop flight of 783 miles, but owing to a series of accidents, the flight was not resumed until June 1st, nine days after landing at Binghamton.

Miss Stinson left Grant Park, Chicago, at 7:37 A.M., May 23rd, carrying Government mail which she expected to deliver in New York before night. She was forced, however, to land two miles north of Binghamton at 6:40 o'clock that night as her supply of gas was exhausted.



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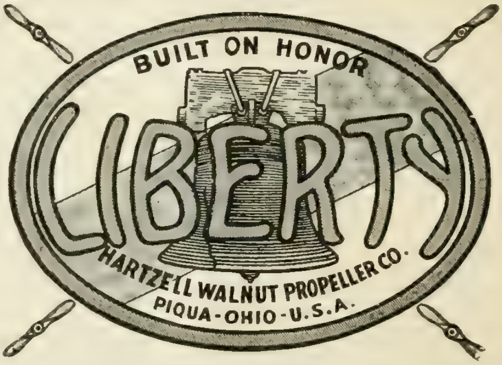
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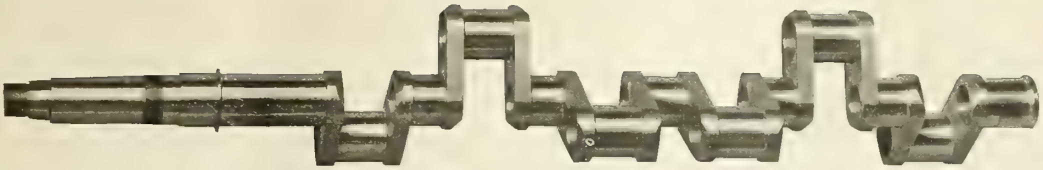

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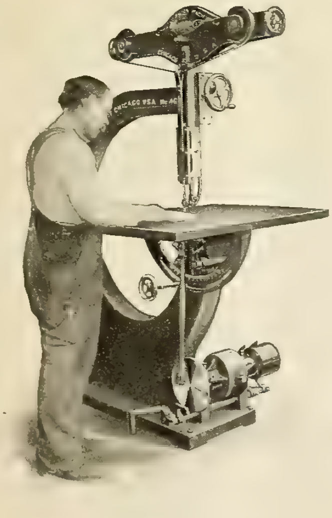

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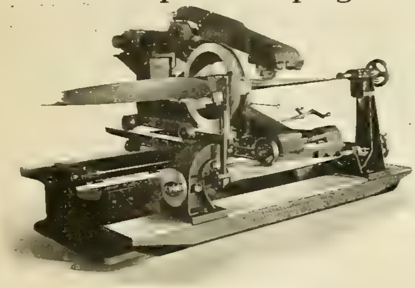

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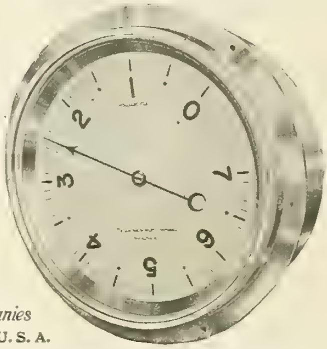

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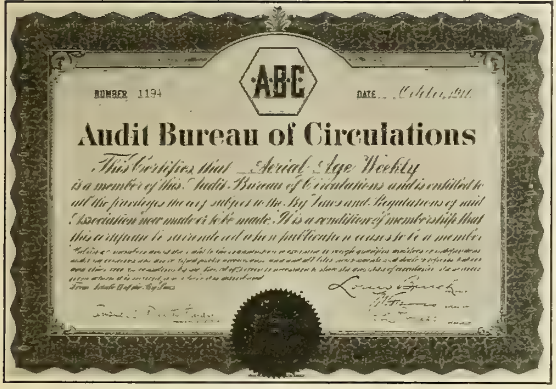

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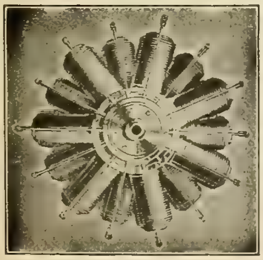

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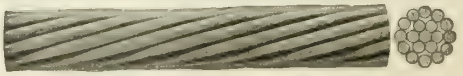

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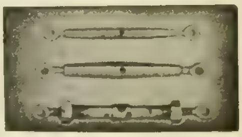

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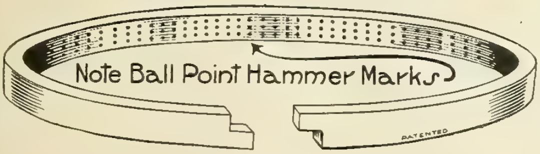

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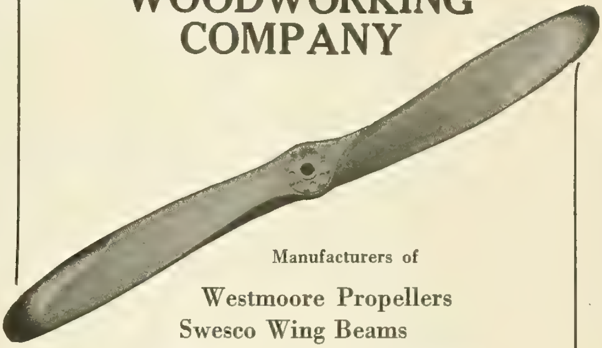

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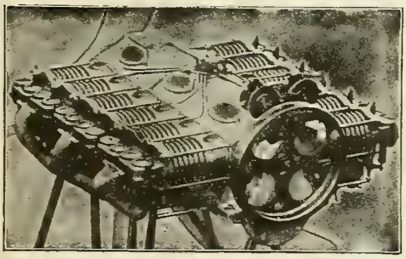

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Fuel Consumption—70 H.P.—7½ Gals. per hour, Low Grade
Fuel Consumption—105 H.P.—11½ Gals. per hour, Low Grade.
Oil Consumption—70 H.P.—¾ Gal. per hour, Good Grade.
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1 WALL STREET NEW YORK, N. Y.

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WE SPECIALIZE

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> **"Boiling tests and salt water soaking tests as follows were made on each specimen: Specimens were boiled for 8 hours, then baked for 24 hours at 100 deg. C.; specimens were soaked in salt water (4% salt by weight) at room temperature for 24 hours and then baked for 24 hours at 100 deg. C.**
>
> **"Results:—The glue held firmly in all tests. Neither the boiling nor the salt water soaking tests caused any indications of separations of the plies of the veneers tested."**
>
> **Dated, March 30th, 1918.**

Laminated wing beams of spruce. We have under contract a supply of aeroplane spruce and could undertake to manufacture 50 sets of 8 wing-beams daily. In an official Government report on a sample wing-beam section submitted by us for test, it was stated —

> **"Conclusion:—These beams carried a much greater transverse load than solid wood beams of the same material and section. The glue joints between web and flanges are stronger in shear than the web section, and the glue had fairly good waterproof qualities. These beams show the superiority of the laminated construction over the solid construction as to strength and great saving in material."**
>
> **Dated, March 11th, 1918.**

We offer single ply birch, maple, walnut, mahogany and red gum in sizes cut to order.

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AERIAL AGE WEEKLY

Vol. 7, No. 14 JUNE 17, 1918 10 CENTS A COPY

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$28,000,000 Emergency Appropriation Asked for Aerial Coast Defense

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Here you see Lieut. Torrey Webb photographed in his airplane ready to start from Belmont Park, L. I., on the first trip of the Air Mail Service between New York and Washington, May 15th, 1918. He is wearing RESISTAL EYETECTS.

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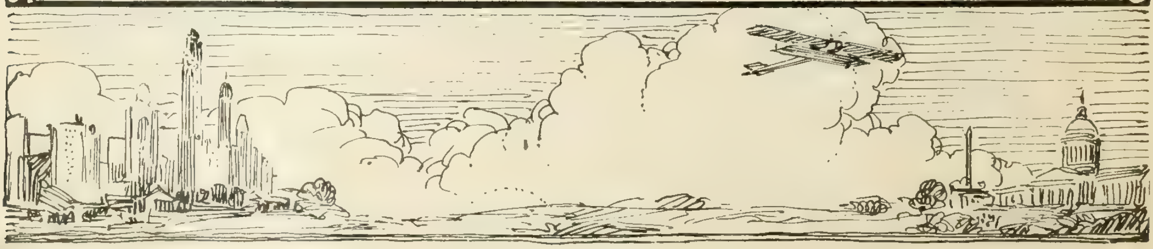

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VOL. VII NEW YORK, JUNE 17, 1918 No. 14

$28,000,000 EMERGENCY APPROPRIATION ASKED FOR AERIAL COAST DEFENSE

EMERGENCY estimates amounting to about $28,000,000 for the purpose of establishing permanent aeroplane and balloon stations on the Atlantic and Pacific coasts, in Hawaii and the Panama Canal Zone, were sent to the House Appropriations Committee on the sixth of June by Secretary Baker.

The destructive excursion of German submarines to the Atlantic seaboard is mainly responsible for the estimates. It is understood that sites have been selected for thirteen stations on the Atlantic, three on the Pacific, three in Panama and three in Hawaii.

In addition twenty balloon coastal stations are planned by the War Department at the several coastal points suitable for observation. The names of the sites selected were withheld because purchases have not been completed. Estimates submitted are in detail as follows:

Construction of sixteen permanent coastal stations, $16,000,000.

Construction of twenty permanent balloon coastal stations, $2,500,000.

Construction of four permanent stations in Panama, $5,500,000.

Construction of three permanent stations in Hawaii, $4,420,000.

The desired amounts will be included in the fortifications bill soon to be reported by the House Committee.

Representative Borland, chairman of the sub-committee on fortifications, according to prior despatches, said he understood the submarine situation brought on the supplemental estimates.

"The presence of German submarines off the Atlantic coast is doubtless responsible for the submission of these additional estimates," said Mr. Borland. "These stations may be quickly built; I believe it takes about six weeks to construct them.

Likely to Get Full Amount

"In the original estimates for the army I understand provision was made for several aeroplane stations to be provided out of a lump sum appropriation, but the estimates submitted are specifically for that purpose, and the Appropriations Committee has jurisdiction to include the amount in the fortifications bill. The larger amount asked becomes necessary because of the aid aeroplanes and balloons may render in hunting down the U-boats wherever they may make their appearance."

With thirteen aeroplane stations on the Atlantic Coast and numerous balloon observation stations this country will have within reach for observation and bombing at almost any point aeroplanes, hydroplanes and balloons. These aerial submarine chasers will patrol the seas and make doubly hazardous the work of the U-boats. There is little doubt the full amount asked by Secretary Baker will be allowed by Congress.

The Secretary wrote to Mr. Borland stressing the importance of making immmediately available funds for a large number of permanent bases for aerial observers. This letter was not made public.

Railway to Be Equipped with Anti-Aircraft Guns

American railways running along or within a few miles of the Atlantic Coast will be utilized to cary anti-aircraft guns in the event of a German aeroplane raid. This plan of protecting even the small hamlets that dot the long reaches of the coast has been discussed by New York and Federal officials. One of the former said:

"The proposed new balloon and seaplane stations to guard against submarine and air attack can be utilized nicely as storage points for mobile anti-air craft guns which are intended to be transferred quickly from one point to another to meet threatened attack.

"For the sake of illustration, say there is created one zone from New York to the Jersey Highland, with three storage points in the zone. Word comes of a possible attack on Asbury Park, say. Within a few seconds the railway cars containing the anti-air craft guns would be on their way and the German aeros would meet the surprise of their lives with guns belching at them from unexpected points.

"Ordinance experts consider it feasible to mount guns of sufficient calibre for this work in reinforced freight cars of special construction. The cars could be thoroughly protected and camouflaged also."

Alan A. Ryan, Deputy Police Commissioner, discussed details in Washington of the new coast defense plan with War Department officials. He also made a report on the enforcement in this city of regulations to guard against a surprise attack from the air.

On the third "dark evening" New York was dimmer by night than ever before in its history, and this includes the Garfield nights of winter memory. Fifth avenue joined Broadway as an "ally of darkness." More than half the cluster lights in Fifth avenue, which were going full blast on Tuesday night, were darkened on stringent police orders.

The few cluster lights which were ashine were furnished with considerably diminished power, so that their rays were cast only a few rods. Broadway, even, was darker than in the last two nights, most directional signs even being extinguished.

The East River bridges were far more dim than on the previous evenings. This applied also to the Williamsburg and Queensboro Bridge plazas.

AERO MAIL EXTENDED TO INCLUDE NEW YORK-BOSTON SERVICE

ANOTHER step in the evolution of the aero-mail service was made on June 6th when Lieut. Torrey St. Webb carried four thousand letters from Belmont Park, Long Island, to Boston in three hours and twenty-two minutes, the distance being 250 miles.

With R. Heck, a mechanician, as passenger, Lieutenant Webb got away from Belmont Field at 12:09 o'clock. The start was witnessed by Richard Vreeland, Assistant Superintendent of Mails; H. L. Hartung, in charge of the Aerial Mail Service; Alan R. Hawley, President of the Aero Club of America, and Henry Woodhouse, a member of the Board of Governors of the Aero Club of America. Two hours later, as the aviator neared Haddon, Conn, he found that his compass was working badly and he descended at Shailerville and fixed it.

At 3:31 o'clock Lieutenant Webb circled over Saugus, Mass., near Reverve Beach and Boston, and then planed down on the estate of Godfrey Cabot, President of the Aero Club of New England, now the Franklin Park Aviation Field. In making the landing he struck soft earth, and the machine tipped up. Webb and the mechanician were thrown out but were uninjured. The plane was severely strained and one propeller blade snapped off.

Assistant Postmaster William E. Hurley of Boston and other Post Office officials were on hand to greet Lieutenant Webb, and the mail was transferred to a motor for delivery in Boston.

On the return journey from Boston to New York, Lieut. Wedd carried Postmaster Murray of Boston as a passenger.

"I have had a wonderful day, full of life, action, and thrills," said Postmaster Murray. "I am confident that we shall soon establish an air mail service that will maintain a regular schedule each day between Boston and New York. I am enthusiastic over the Liberty motor. We had no engine trouble at any time on our trip."

The New York-Philadelphia-Washington aero-mail service is giving great satisfaction in official post office circles, and in a comparatively brief time new routes will be established in the Middle West.

"The success obtained in operating the aeroplane mail service," said Postmaster General Burleson recently, "exceeds what I expected of the new route duirng its initial stages. The army has rendered a splendid service, which is not only a distinct contribution to the commercial world but is proving valuable training for the aviators who are about to enter upon a greater task in France."

Bill for Federal-Controlled Aircraft Corporation Introduced in Congress

At the request of John D. Ryan, in charge of aircraft production, Senator Chamberlain, Chairman of the Committee on Military Affairs, on June 10, introduced a bill for the creation of a $100,000,000 corporation to handle aeroplane construction.

The purpose of the measure is to speed up still further the production of aeroplanes for the American Army and to put the whole matter on a strictly business basis. Under Senator Chamberlain's bill, the new corporation is to be Government controlled, and is to have the most complete charge of aviation from the production angle.

Mr. Ryan's reason for requesting passage of such a measure by Congress as stated in the press is said to have been his belief, that in no other way could he so effectively organize for speedy production, at the lowest cost compatible with good results, as under a corporation charter.

The Military Affairs Committee is to consider the measure at once, and is expected to report it without delay.

Congressman Dent Presents Aircraft Figures to Military Committee

Definite figures on the production of aeroplane motors were submitted to Congress on June 7 by Representative Dent, chairman of the House Military Affairs Committee. Up to May 18, he said, 5,294 planes actually had been delivered to the Government by the factories. A large proportion of these, 4,365, were elementary training planes. Advanced training planes to the number of 620 were delivered.

Only 114 combat planes were completed and turned over to the Government at this date. In addition, 195 experimental planes were manufactured. They were designed mainly for the purpose of trying out new ideas in aviation and in finding the types of planes best adapted to certain kinds of motors.

Engines were manufactured in greater number than planes but were in a somewhat similar ratio. Those for elementary training were 6,126, for advanced training 1,825 and for combat 1,043, a total of 8,994. The reason for the advance in the proportion of combat engines is that in actual service it is necessary to have a greater number of engines for every plane than in training. Facilities for manufacture also figured in the output.

Mr. Dent said 31,846 machine guns had been delivered, but the Signal Corps has not received its allotment from this number. Although 843,735 bombs largely for aeroplane work had been ordered none had been delivered on May 18. Of 1,077 balloons contracted for 120 had been delivered.

The United States has twenty-seven flying fields, including two fields started Thursday, June 6. There are also seven ground schools for flying officers and two schools for non-flying officers. The United States has 3,467 aviators at home and 1,746 abroad, a total of 5,646. Altogether the Signal Corps has an enrollment of 99,001 enlisted men in the United States and 38,367 abroad, a total of 137,368. More than 4,000 men are awaiting assignment to ground schools. The number in attendance at the ground schools is 3,394 and at the primary flying fields in the United States 3,398.

There are 152 receiving instruction in the pursuit schools, 432 in observers' schools, 542 at bombing schools and 1,036 at the advanced schools. Balloon observers also are receiving training on this side, 316 receiving instruction at this time.

According to the figures of Mr. Dent, seven American aerial squadrons are actually at work over the American lines. This does not include American planes that have been co-operating with the French and have not yet been assigned to an American aerial unit.

The Aircraft Investigations

June 4

The Sub-Committee of the Senate Committee on Military Affairs including Senators Charles S. Thomas, Colorado, chairman; Hoke Smith, Georgia; James A. Reed, Missouri; Joseph Frelinghuysen, New Jersey, and Harry New, Indiana, expected to complete, on June 4, a two-day inquiry into the progress of the aeroplane production so far as the plant of the Curtiss Aeroplane and Motor Company are concerned.

Senator Thomas of Colorado, speaking personally, and as reported in the press, said that what had been found so far had been gratifying.

"They are doing more toward the production of aeroplanes than we had reason to expect and there appears to be prospect of a greatly increased production," he said.

June 5

Nineteen thousand Liberty motors, produced mainly in Detroit, will have been delivered to the government by September 1, 1919, according to members of the committee in charge of the Senate Investigation into aircraft production who arrived at Detroit June 5 to inspect local factories. Senator Hoke Smith of Georgia was the only member of the committee absent.

Senator Thomas of Colorado, chairman, said the Government "needs aeroplanes on the French front and needs them badly."

June 6

The Senate Sub-Committee, who are visiting Detroit to inquire into the production of Liberty motors and aeroplanes, express the opinion that manufacturers here have not been remiss in efforts to produce, and they are not profiteering.

Senator Charles S. Thomas of Colorado, Chairman of the sub-committee, said, according to press reports:

"Production of Liberty motors here in Detroit has not been sufficient to satisfy needs; it has not been up to expectations, but it has been commensurate with possibilities. There is every evidence that difficulties have been overcome and organization perfected and that the local makers of this engine are on the eve of very great production. I don't want to say that the committee is satisfied with production, but we are satisfied with prospects. There are matters to be remedied which I can't talk about now."

June 6—Hughes Investigation

Gutzon Borglum, whose sensational accusations against officers and others connected with Government aircraft production, were aired before President Wilson asked Charles E. Hughes to act with Attorney General Gregory in investigating such charges, was examined to-day by the Attorney General, Mr. Hughes and Assistant Attorney General Frierson. He was closeted with the investigators all day, his testimony being recorded in full by stenographers.

It is understood Mr. Borglum told in detail of how he first became interested in the nation's aeroplane programme and of the facts he uncovered in his investigation with the sanction of the President. He also is said to have explained his connection with an aeroplane manufacturing project of which he was one of the promoters. His testimony was not made public and officials declined to say whether he would appear again.

Another investigation under way by the Department of Justice to determine whether there was graft or extravagance in connection with the Government shipbuilding plant at Hog Island will not be completed for some time. Assistant Attorney General G. Carroll Todd, in charge of the inquiry, said to-day he did not know how much longer the work would take.

June 9

Members of the Senate Military Sub-Committee investigating aeroplane production, returned to Washington June 9 after visiting plants in Buffalo, Detroit, Indianapolis, and

(*Continued on page* 692)

THE NEWS OF THE WEEK

Orville Wright Believes Aero Attack Possible

Dayton, Ohio.—That an attack from the air by a German aeroplane at this time is only a remote possiblity is the sentiment expressed today by Orville Wright, inventor with his brother, the late Wilbur Wright, of the first heavier than air flying machine.

"It is entirely within the realm of possibility to transport an aeroplane of a smaller type from Germany to the shores of New York," said Mr. Wright. "A machine could be knocked down and stored in a submarine of sufficient size and capacity, but aeroplanes that bombed cities in this war are of the bombing type, entirely too large and massive to admit of transportation by submarine. A smaller machine could do but little damage over New York and the pilot would have to understand the minute he shot from the submarine that he was on a hazardous mission.

"Assembling an aeroplane on top of a submarine would require an unusually quiet sea and the submarine would, of course, have to ride on the surface of the ocean, a perilous thing just now. The enemy will be working at a tremendous disadvantage if he undertakes to make an aeroplane raid upon our Eastern ports," said Mr. Wright.

Such an attempt on the part of Germany would only serve to stimulate our people to greater enthusiasm and excite a more militant spirit throughout the entire nation.

Aeroplanes in Enemy Radio Hunt

Atlantic City, June 8th.—Aeroplanes are assisting in searching a wood in New Jersey which is suspected of concealing wireless apparatus used by German agents in communicating with submarines off shore.

New Air Service Insignia

Washington, D. C.—The General Staff has under consideration several designs of insignia for the Air Service, but no insignia has been definitely settled upon. An officer assigned to any branch of the Service for which no distinctive insignia is provided wears the insignia of his regular branch. An officer who has been called to service from the Reserve Corps or assigned to special duty, and also unassigned officers, may wear the special service insignia, which is the coat of arms in a circle; or it may be better described as a cut-out coat of arms surrounded by a circle. It has been decided not to continue the use of the coat of arms superimposed on a disk which was formerly worn by officers on special assignment.

Air Raid Precaution Continued

As we went to press last week notice was made of the Police Commissioner's order that all unnecessary lights in New York City should be darkened. The precaution is being continued and subsequent regulations issued.

Commissioner of Police Enright has issued the following instructions:

"The Police Department desires to notify all residents of the city through the press, that in the event of raids on this city by enemy aeroplanes. the following signals will be given:

"Siren horns or whistles will be sounded continuously for ten minutes. When this signal is given every one should immediately open the windows of their homes or offices and go at once to the cellar of the premises.

Major John Purroy Mitchel, ex-Mayor of New York, now stationed at the North Island Aviation School at San Diego, Cal. © Committee on Public Information

"When the danger has passed a signal will be given by short blasts of siren horns or whistles at intervals of one minute each for a period of twenty minutes."

Fifty aeroplanes from the Hempstead aviation field have been patrolling the coast between Coney Island and Montauk Point in search of submarines. They were all equipped with machine guns, bomb dropping devices, and each carried a cargo of bombs. They flew in fleets of eight, in V-shaped formation.

Similar flotillas have been operating from Bay Shore, New London, Conn., and Block Island. The coast has been divided into zones and each fleet will operate in its own zone.

Signal Corps Needs Radio Experts

Washington, D. C.—An appeal for enlistment of radio and buzzer operators has been made by the Signal Corps.

The demand for specialists in the American Army is increasing daily. Mechanics and technicians of every kind, including radio, buzzer, telegraph, telephone and cable operators.

It is important and interesting work, since without this branch of service the Army's "ears" would be stopped and in many instances its "eyes" would be valueless. Men who are expert telegraph and radio operators in civil life have an opportunity here to continue their speciallty.

In nearly every large city the Federal Board, through local school authorities, has established schools of radio communication where all men of draft age who have not yet been called may receive preliminary training in the operation of buzzer and radio instruments.

The Signal Corps is particularly in need of highly trained technical personnel. Electrical engineers and men with good fundamental training in engineering or physics will find excellent opportunities for service of a character which will permit them to make use of their training and experience. Men of satisfactory qualifications are given three months' training in special Signal Corp's schools, operated under the supervision of the Land Division of the Signal Corps, and are given every opportunity to take examinations leading to promotion.

Aeroplanes for Independence Day Unity Parade

New York City, June 5th.—At a meeting of the Mayor's Committee on National Defense, Augustus Post, representative of the Aero Club of Ameirca and honorary secretary of the Aerial League of America, proposed that an air parade be made part of the pagaent parade, which was being planned for Independence Day.

"Not only," he said, "would there be American air squadrons, if they can be spared from the hunt for Hun submarines, but Italian and French planes along the line of march."

The National Government was represented at the meeting by Collector of the Port Byron D. Newton, and among those assisting in the deliberations were Captain Whitwell, head of the British War Mission; A. S. Somers, President of the Board of Education; Henry McDonald, Chairman of the Mayor's Committee on National Defense; Joseph Appel, representing John Wanamaker, and other prominent citizens.

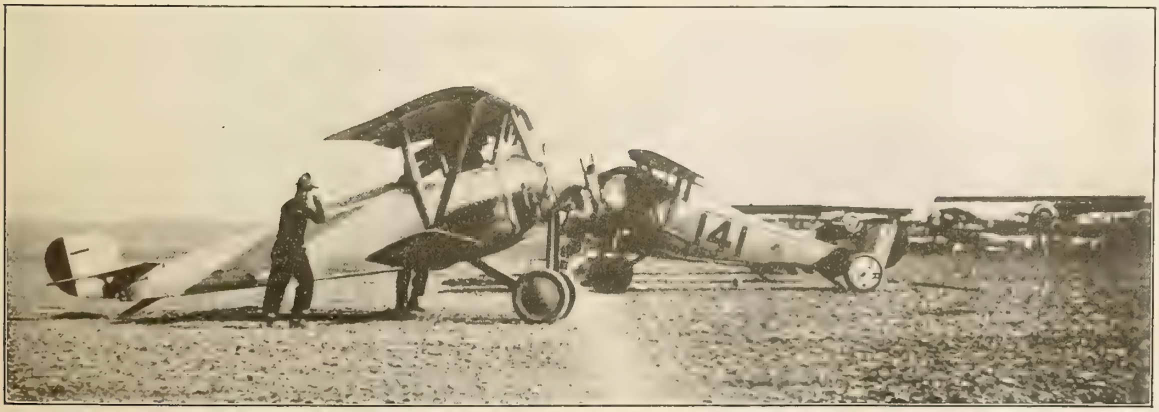
Aero Map of Kelly Field Being Prepared

An aerial map of the great army aviation training field at Camp Kelly, near San Antonio, Texas, requiring more than 40,000 photographic exposures, is being prepared at the section of Reconnaissance Photography of the Flying Department. A considerable section of the map has already been prepared. Many of the individual photographs, taken by aviators, have been assembled, and when complete the map will give a birdseye view of the field.

The photographs are taken from aeroplanes flying at a height of 5,000 feet and traveling sixty to seventy miles an hour. Each photograph covers an area of two-fifths by three-fifths of a mile. When finished, they are placed together and form sections of the map.

New Aerological Stations Planned

Suitable sites for additional aerological stations for the observation, measurement and investigation of atmospheric phenomena in the aid of aeronautics have been selected by the Weather Bureau at Broken Arrow, Okla.; Ellendale, N. Dak.; Droesbeck, Tex.; Leesburg, Ga.; and Royal Center, Ind. This was done under the Army appropriation act for the year ending June 30, 1918, authorizing $100,000 for this purpose. Installation of equipment has been completed at the Ellendale station and daily free air observations are being obtained. It is expected that free air observations will be begun at the other four stations about July 1st. The work to be conducted at all of these stations is similar to that at Drexel, Nebr., where daily kite flights are made, and about twice each month the atmospheric changes during the day at different altitudes are studied by means of successive flights continuing from 30 to 40 hours.



A group of Nieuports at an aviation field in France getting ready for the day's work. © Committee on Public Information

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Aviation cadets working on the clay pigeon rifle range, North Island, San Diego

British Aircraft Ministry Officials

London, Eng.—According to information given in Parliament, the following is a partial list of the principal departments and the names of officials in charge of the Ministry of Munitions:

Finance Group: Aircraft and Explosives Finance, Sir Philip Henriques, K. B. E., director.

Ordnance Group: Controller, Timber Supplies, Mr. D. Bain, C. B. E.

Air Group: Aircraft Production, vacant. Assistant Director General, Sir Henry Fowler, K. B. E. Controllers: Supply, Brig. Gen. W. Alexander. Technical, Lt.-Col. J. W. Weir, C M. G. Director, Inspection, Lt.-Col. R. K. Bagnall-Wild. Controller, American Assembly, Mr. Alexander Duckham.

Augustus Post Gives Aviation Lecture

White Sulphur Springs, W. Va.—Greenbrier sojourners heard a most interesting talk on aviation when Augustus Post, Honorary Secretary of the Aerial League of America and acting secretary of the Foreign Service Committee of the Aero Club of America, talked on the aviation programme in the war. Official pictures of aviation in France, authorized by the French Government, were shown.

Naval Aviation Enlistments Open

The commandant of the Third Naval District, 280 Broadway, has requested us to publish the following news items concerning enlistment in the Naval Aviation section:

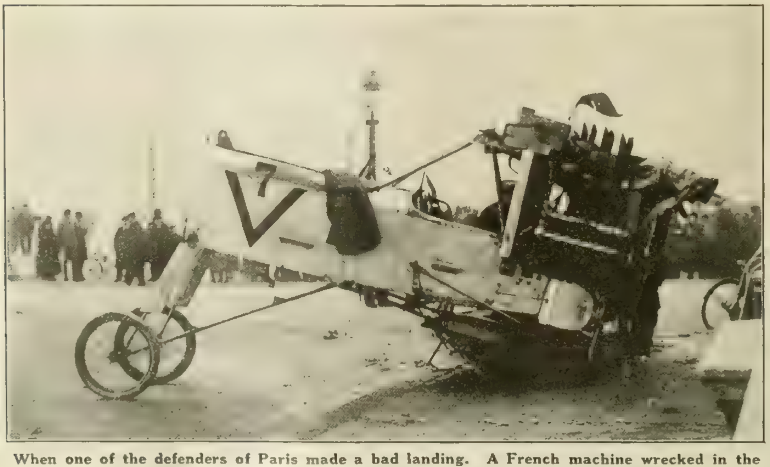
> Here's a chance to enroll in the United States Naval Reserve Force and work at your own trade.
>
> The naval aviation section needs a great number of men immediately. Good ratings and good pay are possible for qualified men.
>
> Here is the list of ratings and the necessary trades.
>
> *Machinists' Mates*—General machinists, automobile mechanics and assemblers, toolmakers, diemakers and similar mechanical trades.
>
> *Quartermasters*—Cutters and cloth fitters, upholsterers, canvas workers, painters, tent riggers.
>
> *Carpenters' Mates*—Woodworkers of all kinds.
>
> *Blacksmiths*—Toolsmiths, forge men, furnace men, etc.
>
> *Coppersmiths*
>
> *Shipfitters* and all kinds of sheet metal workers.
>
> Applicants must be American citizens from 18 to 35 years of age. Draft registrants will be accepted upon presentation of a letter from their local boards.
>
> Men of the foregoing trades will be sent to school for special training. Applicants may enroll at 51 Chambers Street, New York, or at any Naval Recruiting Station in the United States.
>
> There you are. Now sign up and help the Navy Airboats get the U-boats."

Washington to Boston Sky Post Route Being Charted

Meterological observations were taken by Lieut. James C. Edgerson, of Washington, Wednesday in a flight between Washington and Philadelphia. The readings of the instruments were announced by the Post Office Department.

Flying over Laurel, Md., at an altitude of 15,300 feet, the pilot found the temperature reading at 60 degrees, while it registered 90 as he left the ground at Potomac Park in Washington

Wind velocity was materially decreased at this high altitude, and the engine power slightly reduced. The tests were made in a new plane. The Post Office department officials are seeking an air lane which will permit fast flights in the delivery of the mail.



When one of the defenders of Paris made a bad landing. A French machine wrecked in the streets of the French capital. ©Committee on Public Information

Chanute Field News

Rantoul, Ill.—It has been announced that a trainer for the flyers will be sent to Chanute Field in the near future, whose duties will be to see that aviators are fit for flying before they make their trips. This plan of placing a trainer in Government aviation camps has been urged by Walter Camp, the well-known authority on sports, and the Aero Club of America.

Flyers from Chanute Field made a cross country trip to the Ravisloe country club, near Chicago, on June 8th to boost the Red Cross Golf Match. Chick Evans and Jerome Travers were among the participants in the match. A large sum was raised.

The University of Illinois baseball team defeated the Chanute Field nine recently by a score of 13 to 4. The game was witnessed by a large proportion of the cadets and local enthusiasts

British Like Liberty Motor

Tests of the Liberty motor made in England "place the engine at once in the first line of high-powered air engines," the British Air Minister cabled Lord Reading, British Ambassador to the United States.

"The British technical authorities," said the message, "have reportd to the Air Minister that the Liberty engines have now been subjected to sufficient air experiments in England to warrant confidence in this engine. Excellent results have so far been obtained, which place the engine at once in the first line of high-powered air engines.

"Naturally service experiment in the field is still to be obtained, but the Liberty engine will be a most valuable contribution to the allied aviation program, and the United States should develop production with every confidence.

Post Graduate Course in Executive Work

An order just issued by the Director of Aeronautics makes provision for special training along executive lines for all such newly-made officers who may show ability in the conducting of the departments which go to make up a military post. A post graduate course in the management of offices like Disbursing Officer, Supply Officer, Engineer Chief, Executive Officer and similar positions is prepared for them. There seems to be a dearth of such officers.

Inquiry Into Aero Accidents Proposed

Washington.—A resolution calling for a Congressional investigation of accidents at Aviation Camps was introduced June 5 by Representative Husted, of New York.

Accidents in the last five weeks, the resolution says, show that some have been due to defective construction or negligent inspection.

Bruner in Flight for W. S. S.

Harold M. Bruner, a youthful aviator, made his initial flight of the season on Decoration Day, when he gave three successful exhibitions before a large crowd at the Erie Exposition. He dropped literature in aid of War Savings and Thrift Stamps. A special permit was obtained from the Joint Army and Navy Board to allow him to make this exhibition flight. He has applied to Washington to enter the Naval Air Service.

At the Aviation Training Schools and Camps

The commandant of the Dunwoody Naval Training School has been authorized to enroll a second unit of twenty-five men as student officers for the Naval Reserve Flying Corps for ground training at Dunwoody. Men of the first unit, having successfully passed their examinations upon arrival at the Massachusetts Institute of Technology, have been detailed in small groups to Akron, Pensacola, Miami and Key West for fighting training. Chief Master-at-Arms W. Eastman, U.S.N.R.F., who was in charge of the first unit, has returned to Minneapolis, however, and has been commissioned ensign to assist in the instruction of the new recruits.

The flying season was officially opened at the U. S. Naval Training Station, Great Lakes, Ill., when Lieut. Lee Hammond and Ensign D. P. Forbes made a tryout flight over the camp. Flights will be made daily for the remainder of the season, weather permitting.

To facilitate flying at the lake, a new south entrance is being constructed on the boat house.

Camps and Schools

A most peculiar accident happened near Babylon, L. I., on June 3rd. A marine aeroplane attached to the naval station at Bay Shore, during a manoeuvre today, struck the top mast of the Commodore, a sailing yacht belonging to John Vanderveer, and then tumbled headlong into Great South Bay. The accident accurred a short distance out of the bay, between Babylon and

Bay Shore. The pilot was endeavoring to make a circle just above the vessel, but misjudging his distance drove the nose of his plane against the mast.

The pilot was rescued by a crew from the naval station.

Two American aviators, Ensign Roleau and Mechanic Harrington, were brought to port on June 4th by a U. S. patrol boat, which had rescued them from their disabled hydroaeroplane adrift ten miles southeast of Sankaty Head, at the east end of the island. The machine sank soon after the two men were taken off. They had been forced by engine trouble to alight on the water on June 3rd.

Camp John Wise, the balloon observation school, is to be further enlarged. It is reported that approval has been given for taking over 44 acres near the school.

As originally laid out, Camp John Wise was located on 60 acres of land. Since its establishment, it has been twice increased in size.

May 24th

Lieutenant Edward Rickenbacher, of Columbus, Ohio, has shot down his third enemy machine. The latest victory was achieved near Thiaucourt.

An American aerial pursuit squadron is operating over the American sector northwest of Toul. All the pilots whose air exploits have been recorded up to this time belong to this squadron, which has a special insignia. The squadron is flying Nieuport chasing machines.

General Pershing's official communique of May 24th reports that "In Lorraine on May 21st a hostile aeroplane flying over our lines was disabled and forced to land in our own territory. There it was destroyed by our artillery fire adjusted with balloon observation."

An American Escadrille, composed of aviators chosen from among the best American pilots, in the future will help to defend Paris against enemy air raids.

Offer of this help was made spontaneously by the chief of the American Aviation Service and accepted by the French Government through M. Dumesnil, Minister of Aviation.

Corporal R. Sidney Drew, son of Sidney Drew, well known on the screen and the stage and a nephew of John Drew, the actor, who enlisted in the French aviation corps in 1917, was shot down in a fight with an enemy plane inside the German lines, according to information received in New York.

Major Raoul Lufbery left his life story two-thirds written. His comrades say it was one of the most thrilling books of the whole war. Lufbery was writing the book in French, and Captain David Peterson was translating it into English. The American aviators are urging Peterson, who was Lufbery's closest friend, to finish the book immediately. It is not only literature, but it is believed it would be vital in stirring up America.

May 25th

Lieutenant Edward Buford, Jr., of Nashville, Tenn., shot down a German aeroplane near St. Mihiel in a daring battle over the German lines. Buford was attacked by four enemy aeroplanes. He picked out one of the fliers and gave battle, who attempted to maneouvre him into the center of the other German fliers. Huford, however, eluded them, quickly swinging homeward. One of the Germans tried to head him off with the result that he went crashing to earth.

A dispatch from the American headquarters on the British front, cabled by the Associated Press on May 25th, reports that four American aviators have been brought down over the German lines.

May 26th

The Cross of War was given to Lieutenants Walter V. Barneby, Pilot, of Oklahoma, and Kenneth B. Culbert, observer, of East Orange, N. J., for their courage and skill on a trip over the enemy lines, which resulted in the death of both. They were making observations over an important sector of the German line when bombarded by powerful aircraft guns. Despite the heavy barrage, they completed their task, but in returning their crippled machine toppled to the ground when just over our lines.

Lieut. Douglas Campbell, the first American trained "Ace," is reported to have been slightly wounded in a fight with another German aeroplane.

The honor of being known as his country's first American trained "ace" was earned spectacularly by Lieut. Douglas Campbell on May 31st in a twenty-minute air battle. Campbell downed his first enemy aeroplane on April 15th, his second on May 21st, and three more in the subsequent ten days.

College Training for Drafted Men

Washington, D. C.—Special training of drafted men by universities and colleges is working successfully. The committee on education and special training of the War Department, in a report, shows that the University of Pittsburgh is training 650 men for service as gas engine and automobile mechanics in the army. When the plan was announced in March, the University of Pittsburgh discussed provisions of training and housing 100 men. Less than a month later 326 men were taking instruction, and this number has since increased to 650. It is anticipated that the number will reach 2,000 by August 1st.

The work at this university is confined to the training of gas engine and automobile men. The equipment facilities for this work are particularly complete at this university.

Paris-London Air Mail

Paris.—Aviators De Vienne and Lorgnat flew from Paris to London and back in a hydroaeroplane in three hours and ten minutes, carrying mail, on May 28th.

It was the first trip in connection with an aerial postal service between England and France which is being organized.

THE EVOLUTION OF AERO ENGINE WEIGHT

THE War Department authorizes the following statement of evolution in aircraft engines prepared by the National Advisory Committee for Aeronautics:

The first man-carrying aeroplane flights were made in December, 1903, with the Wright Brothers' engine developing 12 horsepower and weighing 152 pounds or 12.7 pounds per horsepower. In 1910, seven years later, the average horsepower of aeronautic engines had increased to 54 and the weight decreased to 5.7 pounds per horsepower. In another seven years, 1917, the average power output had advanced to 243 horsepower and the weight decreased to 2.8 pounds per horsepower. In March, 1918, the Liberty twelve developed 432 horsepower for a weight of 808 pounds or 1.86 pounds per horsepower. At the present time, May, 1918, the Liberty twelve is yielding a maximum of 450 horsepower for a weight of 825 pounds, or 1.83 pounds per horsepower.

The following table shows the advance in the average power-weight ratio by years for the engines in actual flying use. It is to be especially noted that the Langley-Manly engine, built in 1901, was nine years ahead of its time in the matter of power output and sixteen years ahead in its weight per horsepower.

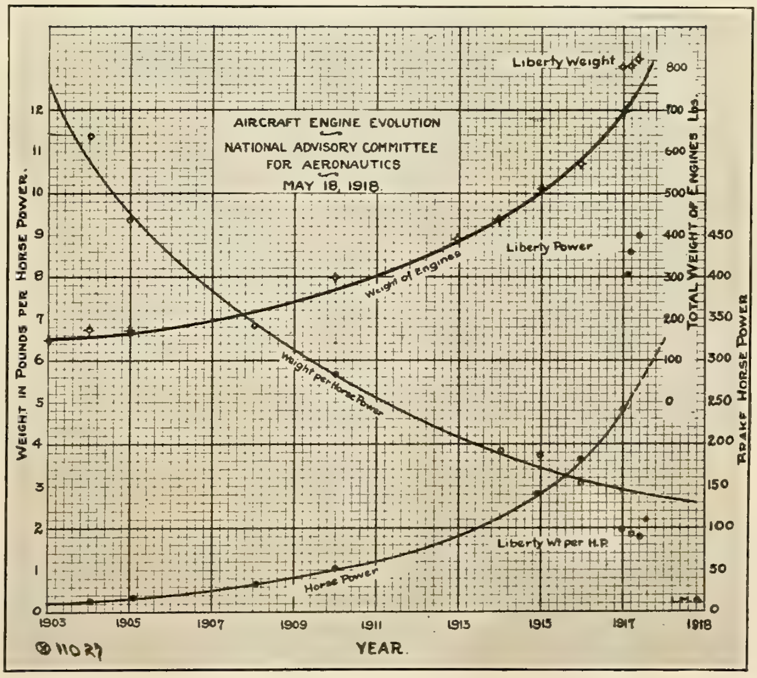
In 1917, the Liberty twelve was 65 per cent more powerful and 28 per cent lighter per horsepower than the average in service for that year. So far this year, these figures are probably changed to 50 per cent and 25 per cent respectively, which indicate the advance of the Liberty over the average engine in service at the present time.

AIRCRAFT ENGINE EVOLUTION

	Year	Horse Power	Wt.	Wt. per H.P.
Langley-Manly Engine..	1901	52	151	2.9
Original Wright Bros...	1903	12	152	12.7
Improved " " ..	1904	16	180	11.4
" " " ..	1905	19	180	9.5
Redesigned " " ..	1908	35	182	5.5
Average on market.....	1910	54	309	5.7
Wolseley Engine.......	1913	147	720	4.9
Average on market.....	1914	112	437	3.9
" " "	1915	133	512	3.8
" " "	1916	185	570	3.1
" " "	1917	243	693	2.8
Liberty 12 Cyl..........	1917	400	801	2.0
" " " (March)	1918	432	808	1.9
" " " (May)	1918	450	825	1.8

The average consumption of fuel decreased from about .8 pounds per horsepower in 1903 to about .65 pounds in 1914, since which it has slowly dropped to .55 pounds in 1918, and, for the Liberty, to .50 pounds. The present Liberty consumption is approximately .46 pounds per horsepower hour.

Illustrating the advance made, the Wolseley Company in 1913 could only obtain 147 horsepower at 1400 revolutions per minute from eight cylinders, five inches bore by seven inches stroke, or 18.375 horsepower per cylinder. This is the same size cylinder as used in the Liberty which now gives 450 horsepower, at 1800 revolutions, from twelve cylinders, or 37.5 horsepower per cylinder, which is double the power per cylinder obtained in the Wolseley. Even if we reduce the Liberty results to the same speed as the Wolseley, that is, 1400 revolutions, the Liberty still represents a great advance, for at that speed 350 horsepower are developed, or 29.2 horsepower per cylinder. Moreover, the Wolseley weighed 4.9 pounds per horsepower as compared with 2.3 pounds for the Liberty at the same speed, or 1400 r.p.m.



The three curves represent the average values obtained from aircraft engines, other than the Liberty, during the period from 1903 to 1917

The AIRCRAFT TRADE REVIEW

Duesenberg Making Addition to Plant

Elizabeth, N. J.—The Duesenberg Motors Corp. is planning an addition to its plant. This will be used as a motor testing department

Detroit Valve & Fittings Dividend

Detroit, Mich.—The Detroit Valve & Fittings Co. has declared a monthly dividend of 1½ per cent on common stock, payable May 31st to stock of record May 25th

Recent Incorporations

Albany, N.Y.—The Ideal Oil & Products Corp., of America. Manhattan, was chartered under the laws of the State of New York to make castor oil, with a capitalization of $100,000. The incorporators are J. E. St. Clair, H. L. Maynard, J. S Evits, of 501 Fifth Avenue, N. Y

The Overseas Equipment Co., of Manhattan, was incorporated with a capitalization of $5,000 for the manufacture of aeroplanes, boats and accessories. The incorporators are C. W. Redfield, J. Keegan, of Sedgwick Place and 67th Street, Brooklyn

Robert Lea Talks On Gyroscopes

Cleveland, O.—At a meeting of the Cleveland Section of the Society of Automotive Engineers, Robert B. Lea, of the Sperry Gyroscope Co., gave an illustrated lecture on the adaptations of the gyroscope. Gyroscopic stabilization of aircraft and seagoing vessels and the application of the gyroscope to the compass were the principal subjects of the stereopticon and moving pictures shown

Want Copper at 30 Cents

Washington, D. C.—Representatives of the copper industry met in Washington last week and stated that 23 cents per lb. is insufficient and asked for an increase to 30 cents per lb. for the 3 months beginning June 1. Small producers said that they would have to discontinue business unless the new price is fixed at least 30 cents

1500 Liberty Engines Already Made

Detroit, Mich.—More than 1500 Liberty aviation engines have been produced to date, according to *Automotive Industries.* At this time four concerns are in production. Packard has produced more than 800. The Lincoln Motors completed 150 in April, and will complete 200 in May. Cadillac and Buick have both started production. Ford will be in production in 2 weeks. Packard is producing 25 engines daily at present.

Director of Oil Conservation Appointed

Baltimore, Md.—W. Chaplin Robinson, head of the William C. Robinson & Sons Company, the oldest oil house in the United States and of the Robinson Oil Corporation, has been called by the National Government to become Director of oil conservation for the United States. Mr. Robinson is winding up his business and will join the forces of the Fuel Administration.

Mr. Robinson will endeavor to save at least 10 per cent on the oil consumption throughout the country.

Personal Pars

Lieut. Charles McGhee Tyson, U.S.N.R., married Miss Betty Carson, of Highlands, N. Y. Lieut. Tyson is a naval aviator and the son of Brigadier General Tyson, of Knoxville, Tenn.

Caleb S. Bragg, automobile race driver and aeronaut, and members of the Aero Club of America, who has been stationed for some time at McCook Field, is to succeed Major Smith as director of flying at McCook Field

Major Delos C. Emmons has been made commanding officer of the United States Aviation School at Mather Field, Sacramento, Cal

Albert H. Hudson, formerly general purchasing agent of the Wright Martin Aircraft Corporation, New York, has assumed the duties of purchasing agent of the American International Steel Corporation, New York

John H. Nelson has resigned from the Bureau of Standards, Washington, D. C., to become research engineer with the Wyman-Gordon Company, Worcester, Mass.

Lieut. Thomas Seymour Knap, of the Aviation Section, Signal Reserve Corps, was married on June 5th to Miss Dorothy Harding, daughter of Mr. and Mrs. G. F. Harding of Brookline, Mass.

The engagement of Miss Edith K. McCabe, of Brooklyn, to Lieut. Chas. L. Foote, Aviation Section, of Cambridge, Mass., is announced

Secretary of War Newton D. Baker addressing the employees at the Standard Aircraft Corporation's works at Elizabeth, N. J.

C. E. Bedell has been appointed superintendent of the boat-hull works of the Curtiss Aeroplane & Motors Corp., Buffalo, in the old experimental shop at Austin Street.

Secretary Baker Visits Standard

On June 6th Secretary of War Baker visited the Standard Aero Corporation's factory at Elizabeth, New Jersey, for a tour of inspection.

Some thirty executives of the factory were called into President Mingle's office to meet the Secretary, and he got a line on industrial mobilization when he found on questioning them that they were all newcomers to Elizabeth.

Moved by what he saw in one of the secret places, the Secretary told them that now he could indeed assure General Pershing that he was going to be emphatically backed up in the air. He promised the men great "doings" when their handiwork was ready for business.

Everybody else in the big works then wanted to see and hear the Secretary, so an impromptu outdoor meeting was arranged and messengers sped through the shops to summon the workers. When they had assembled Mr. Baker told them something of his experiences at the front in France and how when he arrived at an American aviation field he was welcomed by an aerial escort of 100 planes, flying in perfect formation and alignment. The sight reminded him of how important and responsible was the work of the builders of aircraft, and it had therefore greatly pleased him to observe how keen and careful all the Standard workers were.

Fiat Considering After-War Problems

Not the least difficult of the many problems to be faced at the end of the war will be provisions for workers likely to be thrown out of employment during the interval between the cessation of war contracts and the resumption of normal civilian business. This danger threatens the automobile and general engineering businesses more than any others, for the army's requirements of cars, lorries, aeroplane motors and other similar material has caused all these factories to develop considerably and has increased the number of workers in same cases several hundred per cent.

Far-seeing factory heads are already laying plans so that the increased staffs and enlarged plants may be employed to their full capacity on the production of material for which there is likely to be a demand. But there are so many factors over which business men have no control that despite all their precautions there may be a period of transformation during which it will be difficult to keep all workers fully employed.

Realizing this, the Fiat Company has already taken the initiative, in conjunction with the Motor Manufacturers' Association of Turin, of forming a special fund to relieve unemployment during the period immediately following the cessation of hostilities. This fund makes provision for the 50,000 workpeople employed in the Turin motor and metal working industries, 80 per cent of these workpeople being in the Fiat shops.

Funds will be obtained by a deduction from the workman's wages and by contributions from employers. These funds will be controlled by a joint committee of three manufacturers and three members of the trade unions. Relief will be given on a sliding scale, according to the length of time the man has been employed, and whether he is married and has children or not. Relief will be stopped on a man resuming work, or if he fails to report himself for work after a situation has been found for him. The funds can also be made use of to transfer men to another locality if by so doing they can more readily find employment.

This fund is in addition to existing out-of-owrk or benefit societies, and is intended to supplement them temporarily during an exceptional period. It is hoped in this way to attenuate, if not altogether remove, cases of hardship during the reconstruction period following the war.

London-Paris Aero Mail

Paris.—The subject of aerial postal lines from Paris to St. Nazaire and from Paris to Nice is being studied by the Postal Administration, with the eventual extension of the service to Rome and Corsica under consideration. Two aviators made an experimental postal trip from Paris to London June 6th. They used seaplanes, carrying 300 kilograms of mail matter, and the trip to London and return was made in five and one-half hours.

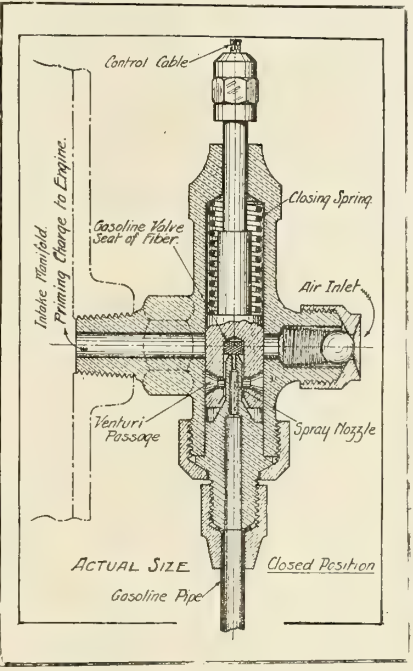
THE COPLEY PRIMER—A MINIATURE STARTING CARBURETOR

HARD starting of gasoline engines is due to the fact that the fuel now on the market has been reduced in specific gravity until the energy developed in the present day carburetor at cranking speeds is not sufficient to vaporize it. This condition is, of course, very much aggravated by cold weather. Sufficient energy must, therefore, be used to break up the fuel before a quick start may be expected. There are two ways of producing this energy. One is by using electricity for heating to vaporize the fuel and the other is by mechanical means to atomize it. The inventor of the Copley Primer has elected to use the atomizing principle, as it is by far the quicker method and may be used on all engines whether electrically cranked or not.

Referring to the blue print (cut) it will be noticed that the primer is screwed into the intake manifold above the throttle. In the primer is a plunger valve which normally remains closed and means are provided to insure it against leaking any air into the manifold when closed.

In the primer is a small air passage, 1/16" in diameter into which atmospheric air passes after leaving the ball check valve. This stream of air passes directly over and against the gasoline nozzle and thence to the intake pipe and engine. In starting, the throttle is closed practically down, that is just off the stop screw. The primer is opened and held open while the engine is cranked. It will be seen that the depression in the manifold will induce a terrific speed of air through the primer, which produces the required extra energy to atomize the heavy gasoline now being used. This has proved to be very successful and starting is effected in about three turns of the crankshaft. The weather has but little effect on the time of starting and all of the many cases of experimentation in the coldest weather seem to indicate that three turns are sufficient. We have tried all weather conditions down to 10 degrees below zero and even lower and the longest period of time required was about 15 seconds from the time the starting button was pressed until the engine was firing regularly. I say firing "regularly" with understanding of what "regularly" means in this case, for we always hold the primer open after firing begins until "regular firing" is accomplished.

We have found that engines will operate satisfactorily on this principle of priming without any aid whatever from the carburetor. It has also been found that the same size air stream and gasoline nozzle are all right for any sized engine from the Ford to the Curtiss Aeroplane Co.'s large engine. This large aviation engine has been started innumerable times on the third revolution of the crankshaft, when hand-cranked.



A word should be said regarding the use of the familiar "choker" of the carburetor. It is thought that the "choker" should accomplish this desired result, but this is erroneous, because the choker, not being located right at the jet, does not furnish the energy necessary to atomize the fuel. All the choker does, is to produce in the manifold a higher degree of vacuum and hence draw out more gasoline from the nozzle, but this gasoline must be atomized if a quick start is to be expected. It must be a finely divided mist, and not a heavy rain, and it is just this condition of finely divided mist which is accomplished by the Copley Primer.

International Aeronautical Instrument Corporation Formed

New York City.—The International Aeronautical Instrument Corporation has assumed all the assets and liabilities of the Aeronautical Department of A. Haustetter, a large optical concern of 308 Madison Avenue, New York. Mr. A. L. Haustetter is president and treasurer of the new company, and Mr. A Johns is the secretary. The company will deal in altimeters, air speed indicators, barographs and aeronautical compasses.

Gasoline Prices Fixed

Washington, D. C.—Prices of fuel oil for the Allies were fixed as follows:

F. O. B. Gulf ports—5½ cents per gallon by British Admiralty specifications. 5¼ cents per gallon by United States Navy specifications.

F. O. B. Atlantic Seaboard—7½ cents per gallon by United States Navy specifications. Prices of standard white kerosene were fixed at:

F. O. B. Gulf ports—7½ cents per gallon. Prices of standard white kerosene were fixed at:

F. O. B. Atlantic Seaboard — 8¼ cents per gallon.

Mexican reduced oil was fixed at 6 cents per gallon via Atlantic Seaboard.

These prices became effective May 20 for 60 days. The price of gasoline to the Allies was fixed yesterday by the Fuel Administration as follows:

F. O. B. Gulf ports—21 cents per gallon.

F. O. B. Atlantic Seaboard—23½ cents per gallon.

United States Navy specifications apply in both instances. Prices of aviation naphtha were fixed at the same time as follows:

F. O. B. Gulf ports—30 cents per gallon.

F. O. B. Atlantic Seaboard—32 cents per gallon.

British specifications, 302 degrees Fahrenheit final boiling point, apply in both cases.

THE BOSCH IMPULSE STARTER

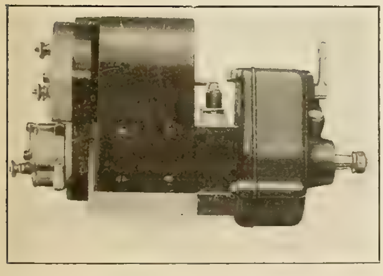
ONE of the many reasons why the magneto is so firmly established as the supreme ignition system is the fact that it does not depend upon any other unit or units for its electrical output and distribution of current.

The magneto transforms mechanical energy into electrical energy. The moment the shaft of a magneto-equipped engine revolves, the magneto begins to generate electrical energy for ignition; and, following requirements, the higher the rate of speed at which it is driven the more intense are the sparks.

To facilitate starting when necessary, the Bosch Magneto can be supplied with an Impulse Starter, which automatically "speeds up" the magneto armature at the exact moment of firing the initial gas charge or charges, thus providing at even low speeds the full electrical capacity of the magneto.

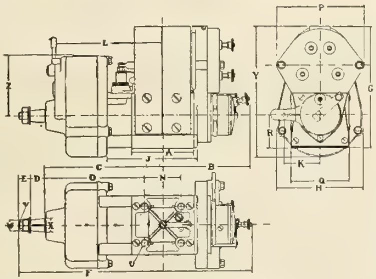
In a word, the Bosch Impulse Starter or coupling is a mechanical device for the purpose of obtaining positive and efficient starting, without the aid of batteries or a battery system of ignition.

The Impulse Starter is located between the magneto drive and the armature; when the engine is cranked or barred over, the armature is held stationary, while energy is being stored up by the compression of a series of springs. At a predetermined moment the springs are released and the armature is given a partial revolution at high speed. In this way, intense sparks are provided and the engine given its starting impulse.



The Bosch Magneto and Impulse Starter ready for service

As soon as the engine commences its regular operation, or attains a speed of about 120 r.p m, the Impulse Starter is automatically disengaged, the "Starter" transmitting the driving energy to the magneto as a flexible coupling.



Section drawing showing location of Bosch Impulse Starter

The function of an Impulse Starter demands a strong, simple, reliable and rugged mechanism, properly balanced and of sufficiently generous dimensions to develop the power necessary for effective performance.

The design of the Bosch Impulse Starter embodies all of these details, and is therefore entirely different from anything of its kind hitherto available. It is totally enclosed in a dustproof and waterproof aluminum housing, and is integral with the magneto itself.

The operating parts are all high-grade steel, giving a high factor of safety, and built to withstand indefinitely the sudden stresses to which they are naturally subjected.

The spring action is carefully balanced, imparting an even torque to the armature, and eliminating all possible vibration. Unlike other devices of similar name, there is no added strain carried by the magneto bearings, the heavier part of the starter being carried on its own sleeve bearing.

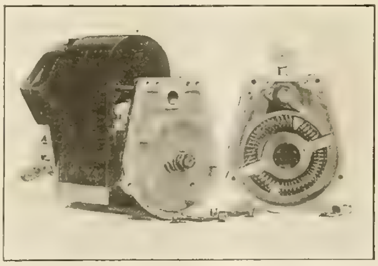
The control of the "Starter" is by means of a lever mounted on a shaft porjecting from the front of the housing. The lever is so constructed that it can either be operated by hand or through the medium of a control connection. The proper movements for the lever are indirated by arrows on the name plate.

The "Starter" is so constructed that should it accidentally be put into engagement while the engine is running, it will not actually go into operation, consequently no damage will be done to the "Starter" or to the magneto.

No attention whatsoever is required, with the exception of a few drops of oil every four or five weeks in the one oil cup with which it is fitted. This communicates with an automatically acting oil reservoir, and provides for all the lubrication that is necessary.

The Bosch Impulse Starter is designed primarily for truck and tractor service in conjunction with types DU4 and ZR4 Independent Bosch Magnetos for four-cylinder engines, but can be supplied also, on special orders, in conjunction with any standard types of Bosch magnetos for marine engines, automobiles, aeroplanes, stationary engines, or for any other ignition service. The Impulse Starter is not an attachment, but is provided only as a part of new Bosch magnetos. Size and dimensions can be ascertained from the accompanying dimension drawings.

Prices will gladly be quoted upon receipt of request, stating size and type of engine.



Showing location of Impulse Starter

ADVANCE ROT AND LATENT DEFECTS IN AEROPLANE TIMBER

By J. S. BOYCE, B.Sc., M.F., Ph.D.
Assistant Pathologist, United States Department of Agriculture, Bureau of Plant Industry.

THE present world war has exemplified in a striking manner the close, and hitherto unsuspected, relation of many branches of business and science to the successful maintenance of the military establishment. The lumber industry especially has been called upon to put forth its maximum effort as an aid in winning the conflict, not only in order to furnish manufactured lumber of all classes for the direct use of our armed forces, but also to aid in many ways indirectly.

But the most exacting demand which the lumber industry has to meet is to supply raw material for aircraft production. The lumber mills of the Pacific Coast particularly have been called upon to furnish enormous quantities of lumber for this purpose. Only the highest grade product of certain tree species can be utilized. While normal wood of Sitka spruce (*Picea sitchensis*) is undoubtedly the best, that of Douglas fir[1] (*Pseudotsuga taxifolia*), sugar pine (*Pinus lambertiana*), western white pine (*Pinus monticola*), western yellow pine (*Pinus ponderosa*) and other species are utilized to a large extent. Hardwoods are used for certain purposes but the far greater number and most vital members incorporated in an aeroplane are of coniferous wood. When these parts are finally certified as suitable for use they must absolutely free from defect or abnormality of any kind whatsoever, and this calls for the most rigid and careful technical inspection by thoroughly experienced men.

. One of the commonest defects its decay, (rot, punk, or as it is sometimes called, "dote"). Decay is caused by the action of wood destroying fungi. A fungus is a very simple plant, made up of microscopically fine threads (hyphae), invisible to the naked eye except when they occur in masses, as is sometimes seen in badly decayed wood. These hyphae use certain constituents of the cell-walls of the wood for food, neglecting others, with the result that the cell-walls are broken down, the wood thus being greatly weakened and more or less destroyed, just as the roots of green plants extract definite constituents from the soil to the point of exhausting it, while in appearance the soil does not seem to be changed in spite of the profound alterations in its physical and chemical qualities. It is the breaking down of the wood and the change in its physical and chemical qualities that we call decay or dote. The degree of decay is determined by the energy of growth of the fungus, the length of time the fungus has been at work, and the type of wood the fungus inhabits.

For the purposes of our discussion two types of wood destroying fungi may be recognized, those mainly attacking the heartwood of standing, living trees and those principally confining their activities to the manufactured product, such as sawed lumber, cross ties, poles, etc. The former rarely continue their work of destruction after the tree has been cut down and worked up into lumber, except under very favorable conditions. The latter, which will be discussed later, are not parasitic, that is, they are unable to attack living trees.

Nearly every known tree species from the temperate zone north is more or less subject to this type of defect and our Pacific Coast conifers are no exception to the rule. Douglas fir is particularly susceptible to attack by the ring scale fungus (*Trametes pini*)[1], sometimes as high as fifty per cent of the merchantable timber in a given stand being destroyed by this organism. The resulting decay, often termed red rot, is easily recognized by the fact that the reddish heartwood of the tree is honey-combed with small white pits in which the substance of the cell walls of the wood is reduced to cellulose. Douglas fir is also subject to attack by the chalky quinine fungus, *Fomes laricis,* the sulfur fungus, *Polyporus sulfcreus,* a butt rot causing fungus (Schweinitz' toadstool), *Polyporus schweinitzii* and *Fomes roseus.* The same above fungi, with the possible exception of *Polyporus sulfureus* and *Fomes roseus,* destroy the heartwood of most of our pine trees, to which a number of other fungi are to be added.

The theory that Sitka spruce is free from decay is absolutely untenable. The fact is that this species, until the present unparalleled demand arose for aeroplane material, had been of slight economic importance, thus receiving little consideration or study. There are, to the knowledge of the writer, no accurate figures available on the amount of defect due to decay in Sitka spruce, but the San Francisco collection of the Office of Forest Pathology records three different heartwood destroying fungi on this tree, viz., the red belt Fomes (*Fomes pinicola*), Schweinitz' toadstool (*Polyporus Schweinitzii*) and the sufur fungus (*Polyporus sulfureus*), and a destroyer of dead timber *Aurantiporus* sp. Reasoning by analogy we may expect to find several other decays besides the above, for Schrenk (4, pp. 19, 24, 31, 40, 45, 49) reports six wood destroying fungi occurring on red spruce (*Picea rubens*) and white spruce (*Picea canadensis*) in New England, all of which are known to attack other species on the Pacific Coast. Chief among these is the very destructive ring scale fungus (*Trametes pini*). In Europe, Tubeuf and Smith (6 pp. 440, 449, 450, 453) report four wood destroying fungi on spruce, and again the ring scale fungus is included.

Typical decay or rot (dote), is easily recognized. Here the continued activity of the fungus has produced such profound alterations in the wood that even the untrained eye cannot fail to notice them. Advancing from this focus of energetic destruction the fungus hyphæ grow into hitherto sound wood and there begin gradually to break down the structure of the cell-walls, so that beyond the typical decay we find a zone in which the hyphæ ramifying through the wood cells, become less numerous as the distance increases from the area of typical decay until finally they end entirely, quite analogous to the way the roots of a tree spread out in the soil in order to obtain their food supply, becoming smaller and smaller as the distance from the root collar increases.

The distance to which the fungus hyphæ travel in advance of the main body, in other words, the extent of advance rot beyond the typical decay depends very largely not only upon the type of fungus, but also upon the type of wood attacked. In general it may be said that with growing resin content of the wood the advance of the hyphæ becomes slower so that in woods free from resin like fir, or poor in resin like spruce, the advance will be most rapid, in woods containing more resin like Douglas fir less rapid, and in the resinous pine woods even more retarded. In this zone of advance rot the destruction of the wood cells is well under way but visible indications of their condition are in general little understood or recognized. It has been only in the past few years that any exact studies have been made along this line. Meinecke (2, pp. 28 and 51 and 3, p. 33) found in the case of white fir (*Abies concolor*) attacked by the Indian paint fungus (*Echinodontium tinctorium*) causing the stringy brown rot, that the advance rot appeared in longitudinal sections as small light-brownish spots and discolorations intermingled with horizontal burrows. A careful examination was necessary to detect these symptoms. This advance rot invariably went through the mill, reached the yard, and on drying out became brittle and dropped to pieces. Loss of this kind is so common in the yard that it has resulted in a distinct prejudice on the part of the lumberman against this species. The advance rot can be entirely eliminated by proper and more judicious bucking in the woods.

What results in appreciable loss in the case cited where the lumber is used mainly for structural purposes, becomes disastrous in aeroplane construction where the timber is put to the most exacting tests. As long as it is impossible to have every single tree carefully examined immediately after it is felled, no lumber coming from a tree containing decay should be allowed to be accepted. The temptation undoubtedly is great to buck off the decayed part and let the apparently sound portion of the bole go to the mill. It is just this apparently sound part that contains advance rot. In an aeroplane certain members such as wing, beam and struts, all designed to eliminate weight as much as possible are subjected to an extraordinarily severe strain. Therefore, every piece of wood on which this strain falls must be absolutely perfect and of the highest possible strength. To permit any wood with advance rot to enter into the framework of an aeroplane endangers a valuable machine, and, which is far more important, the life of a highly trained man.

The same conditions as in typical advance rot where the latent decay extends beyond the typical decay, prevail in the case of incipient fungous activity. During the first stages of infection of the tree by the fungus the hyphæ act quite similarly to those in advance rot. The young fungous plant, once it becomes established in the heartwood of the tree, spreads through the wood and begins to break down the cell walls by using certain constituents for food. With the growth of the fungous plant its activity becomes more and more destructive until finally a stage is reached which we call decay.

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[1] Commonly sold under the trade name of Oregon pine. Good descriptions and illustrations of most of the fungi mentioned in this paper can be found in a Manual published by the U. S. Department of Agriculture, Forest Service, entitled "Forest Tree Diseases Common in California and Nevada," by E. P. Meinecke.

Unfortunately from our point of view advance rots as a rule do not show up in the yard as in the example cited, and it is in the detection of these latent rots that serious difficulty is encountered. The alterations are often so faint that it requires special training and experience to recognize them. The advance rot in Douglas fir caused by the ring scale fungus, appears as a reddish purple discoloration in the reddish heartwood, often so faint as to be almost unrecognizable except when viewed by a trained eye in the proper light. Hence, material with this defect easily finds its way into the yard where it does not fall to pieces on drying, as in the case cited above, but remains apparently firm in spite of its lessened strength. Of course, it is not so serious when planks or timbers containing this advance rot are used for the usual building or construction purposes, since it is rarely that the maximum strain would be put on them, but it is self-evident that none of this class of material should be permitted to form any portion of the structural framework of an aeroplane.

The advance rot caused by *Fomes roseus* in Douglas fir appears as an inky green discoloration varying from deep to very faint. This is not of so much importance from our viewpoint since the infection nearly always occurs in the upper part of the bole. The chalky quinine fungus produces a reddish advance rot somewhat tinged with purple, often very difficult to distinguish from that caused by the ring scale fungus. The latter, however, is the most important of all, occurring, as it does, so commonly and over so wide a range.

The reader must not get the impression that all color variations from the normal in lumber are indications of advance rots caused by wood destroying fungi. To the contrary—and it is here that an opinion on a definite case must be based on training and experience. For example, heartwood of Douglas fir may be of a somewhat yellowish brown tint instead of the normal red. This does not indicate defect. Wood of this type is just as strong and, as a rule, more easily worked than the usual kind. The cause of this variation in color in unknown, but trees with yellowish wood are most commonly found in the coast belt indicating that conditions of growth may be the unlying factor. Then too, the reddish color of the heartwod assumes different shades in different individuals.

Again in the heartwood of incense cedar (*Libocedrus decurrens*) a very pronounced purplish color is often seen, particularly striking in cross section. While this is often found in trees attacked by the dry-rot fungus (*Polyporus amarus*), it is not the advance rot caused by this organism—in fact, it is not a defect but frequently occurs in normal trees.

Wood around wounds, either open or healed over, invariably presents a color deviation from the normal. Such wood usually has a grayish to brownish shade and a "dead" appearance, difficult to describe but readily recognizable to the experienced eye.

While the variations in color just discussed occur in the wood of standing living trees, the wood is also subject to certain natural changes in color during the seasoning process after it has been worked into lumber. Furthermore, as seasoning progresses advance rots become much more difficult to recognize, the color becomes much less discernible, even disappearing almost entirely. The rough surface of sawed lumber adds very materially to the difficulty of inspection. But more important still, is the fact that almost all coniferous lumber, under certain conditions, is subject to attack by the so-called wood staining or wood discoloring fungi. These fungi strongly stain the sapwood, causing a blueing, blackening or reddening according to the organism at work (sap stain). The hyphæ do not attack the substances forming the cell walls of the wood but obtain their nourishment from materials in the wood cells, rarely boring through the wall in order to pass from cell to cell, but usually availing themselves of natural passages always existing between cells in normal wood. Therefore, the lumber, while rendered unsightly is not necessarily weakened. Relative strength tests for stained and unstained material are not in existence for Douglas fir or Sitka spruce, but no difference was found in the case of western yellow pine (5, p. 14) or short-leaved and long-leaved pine of the south (8, p. 17). Sitka spruce is quite susceptible to attack by these wood staining fungi. Again it is hard to distinguish this type of discoloration from certain advance rots, that caused by *Fomes roseus* for example. This difficulty is enhanced in woods such as spruce where it is often hard to distinguish sapwood from heartwood.

Cases will arise where it is impossible to say from an examination with a hand lens whether a discoloration is advance rot or some harmless color variation. Then the final decision must be based on a careful examination with the compound microscope. It would be impossible to reject on principle all wood showing color variations, on account of the excessive loss both in actual cost, and in the time of skilled workmen.

There can be no question of the principle that wood containing advance rot must not be incorporated into the framework of an aeroplane, and it has been pointed out before that under present conditions only the most rigid, expert inspection will prevent this. But such material should never be allowed to leave the woods. Inspection for advance rots should begin when the trees are cut. For example, when a practically completed wing beam is rejected at the factory, as is often the case the loss is very great in dollars and cents. To this should be added the irreparable loss of time required for seasoning the lumber, of space on our overtaxed rolling stock, and of labor and time of skilled workmen, all of which might have been devoted to sound useable material. If the unsound material had been left in the woods in the raw state the only loss would have been the relatively insignificant cost of felling and bucking the tree. Much of this material can be utilized for other purposes.

Aside from these decays with their advance rots in the heartwood of standing living trees, there is another class of decays which might well be briefly considered here. Certain fungi confine their activities mainly to lumber and timbers. Two very common and widespread forms on the Pacific Coast are *Merulius lacrymans* causing the dry-rot of buildings and *Lenzites sepiaria*, frequently found on rotten cross ties. These two fungi are particularly destructive to coniferous wood. The presence of such decays may usually be traced to improper storage conditions, chief among which is poor methods of piling. Lumber should be piled so that the pieces are well aerated and raised above the ground. It is beyond the scope of this paper to deal in detail with this. For complete and specific information the reader may refer to Humphrey's recent publication (1).

There is one point worth consideration from our viewpoint, however. It has been found in the past that shipments of seasoned Douglas fir stock to South Africa, apparently sound when leaving this coast, sometimes reached their destination with more or less defect due to decay. What really happened is this. Spores, (microscopically small and light reproductive bodies corresponding to seeds in higher plants) of these lumber destroying fungi are found everywhere around lumber mills or docks. The lumber, when loaded, bore many of these spores. When tropical seas were reached, the close hold of the vessel acted as a forcing chamber, the spores germinated (sprouted) and the resulting hyphæ found climatic conditions ideal for their development, causing considerable decay in the lumber in a relatively short time. This is exactly the danger to which shipments of aeroplane timber from Pacific Coast ports to Europe, routed through the Panama Canal, are exposed, especially when the stock comes directly from the mill to the dock without any seasoning or artificial drying as is now often the case. That spruce wood is very susceptible to attack by the dry rot fungus is well known. Indirect reports indicate that loss has occurred in this way. Furthermore, stock so handled must inevitably become completely sap stained. Where transportation facilities and cost make it possible it would be far preferable to ship material of high relative value by rail to an Atlantic port, thus permitting a certain amount of seasoning en route and entirely eliminating the combination of close packing in the hold of a vessel and the moist heat of a tropical climate.

Attention should here also be called to another serious source of weakness in spruce timber, although not caused by fungi. Wood is composed of small elongated cells with more or less thickened cell walls. In dry wood the interior of the cells is filled with air: Consequently the relative strength depends altogether on the mass of cell-wall material per unit of measure. The more cell walls the unit contains and the thicker the cell wall, the stronger the wood. In certain spruce trees the wood cells are unusually large, in other words, there are fewer cell walls and more air spaces per unit. Besides, the cell walls are often much thinner than usual, thus reducing very considerably the ratio of wood material to air. That wood of this type, although in itself sound, is much inferior in strength to normal wood, is self-evident. Failures have already been traced to this abnormal condition. The cause of this peculiarity of growth is not known. The trained eye will easily detect this source of weakness by careful examination of the wood in cross-section with the hand lens. It is self-understood that wood of this type should be rejected for aeroplane construction.

No attempt can be made here to discuss all the defects which an inspector must be prepared to recognize. Pitch pockets, seams, shakes, knots and other plain defects are too well known to deserve specific description. This paper merely calls attention in a very brief manner to the waste involved in permitting

(*Continued on page* 691)

INTERNATIONAL AIRCRAFT STANDARDS

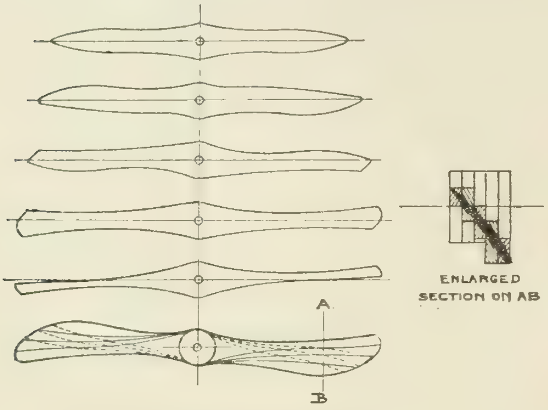
Adopted by the International Aircraft Standards Board

The International Aircraft Standards Board, of the Advisory Commission of the Council of National Defense has formulated the following specifications, which supplement those already published in Aerial Age.

SPECIFICATIONS FOR MAHOGANY LUMBER FOR USE IN PROPELLER CONSTRUCTION 2 W 3 April, 1918

General.—1. (*a*) The General Specifications, 1G1, shall form, according to their applicability, a part of these specifications.

(*b*) This specification is drawn to govern the quality of mahogany lumber supplied for the construction of propellers.



SKETCH SHOWING SHAPE OF LAMINATIONS AND METHOD OF ASSEMBLING.

Fig. 1.—Propeller made of five laminations.

(*c*) Only true mahogany (*Swietenia mahogani*) or such substitutes as are expressely approved may be supplied.[1]

Grade.—2. (*a*) Each board supplied shall yield one or more laminations free from defects (see Fig 1), and the waste on each board shall not exceed one-third of the surface measure of the piece.

(*b*) Shipments on this specification must contain all lumber of better grade that has been produced in cutting the logs at the mill. No portion of higher grade material shall be sorted out and retained by the mill.

Grain.—3. All boards shall be reasonably straight grained and suitable for propeller purposes. Quarter-sawed lumber is preferred.

Texture.—4. Boards containing brashy, doty, or punky wood will not be accepted.

Dimensions.—5. (*a*) Unless otherwise specified in the order, dimensions shall be as follows:

(1) *Thickness.*—Rough, green lumber must be full 1 inch thick.

(2) *Width.*—No board shall be less than 8 inches wide and not more than 10 per cent of the resulting laminations shall be less than 9 inches wide nor more than 25 per cent less than 10 inches wide.

(3) *Length.*—No board shall be less than 8 feet long and at least 80 per cent of the resulting laminations must be 9 feet long or over.

(*b*) The widths most desired are 10 to 14 inches with the greatest percentage between 12 and 14 inches.

(*c*) Lengths and widths shall be measured according to National hardwood rules.[2]

Shipment.—6. Rail shipments shall be made in closed cars, protected from the weather. The lumber must be carefully piled to avoid damage in transit.

Inspection.—7. (*a*) The inspector shall have free access to all parts of the mills where this lumber is being manufactured, and shall be afforded every facility to satisfy himself that the lumber conforms to this specification.

(*b*) This specification shall be subject to construction and interpretation by the inspection department of the purchaser.

References: United States Signal Corps Specifications No. 15028-A.

SPECIFICATIONS FOR CAST IRON 3S 36 April, 1918

General.—1. The general specifications 1G1 shall form, according to their applicability, a part of these specifications.

Use.—2. This material is suitable for piston rings, cylinder liners, valve guide bushings, etc.

Material.—3. The following limits of chemical composition are desirable:

	Per cent.
Total carbon, minimum	2.8
Combined carbon, maximum	.75
Manganese, maximum	.75
Phosphorus, maximum	1.00
Sulphur, maximum	.12
Silicon, maximum	2 2[illegible]

Workmanship and Finish.—4. The metal shall be close grained and uniform in quality. The castings shall be free from cracks, flaws, blowholes, hard spots, spongy spots, excessive shrinkage, and other defects. They shall be well cleaned of gates, risers, and fins, and shall have a smooth surface. Castings must be soft enough to machine readily on all sections. A casting may be rejected at any time because of injurious defects or faults which are revealed by manufacturing operations, notwithstanding that it has previously passed inspection. Such rejected castings shall be returned to the manufacturer at his expense. This clause shall not apply to castings fabricated after export.

Physical Properties and Tests.—5. *Springing Test.*—(*a*) The manufacturer must subject each piston ring to the following springing test. Only rings which withstand this test may be submitted to the inspector. The ring shall be pressed over a cone until the distance between the ends of the ring is equal to seven and one-half times the mean thickness of the ring. Upon removal from the cone the ring must show no set.

Transverse Test.—(*b*) The test bar supported on knife-edges 12 inches (304.8 mm.) apart and loaded centrally by means of a knife-edge shall show the following properties:

Breaking strength, minimum..................400 pounds (181.8 kg.)
Deflection under load of 350 pounds (159.1 kg.), minimum, 0.15 inch (3.81 mm.)

Hardness Test.—(*c*). The test bars shall have the following hardness:

Brinell hardness number...................... 200 to 240
Shore scleroscope hardness number........... 33 to 40

Hardness tests may also be made on castings selected at random and must conform to the requirements specified.

Selection of Test Specimens.—6. (*a*) At least 25 per cent of the piston rings submitted at any one time shall be subjected to springing test.

(b) For all castings other than piston rings test bars shall be cast of the same metal and under the same conditions as the castings they represent. The test bars shall be 0.5 inch (12.7 mm.) square and 14 inches (355.6 mm.) long, and shall have identification marks such as a serial number and date cast on them. One test bar shall be required for each lot of 250 castings or less.

(*c*) Samples for chemical analysis shall be taken from the test bars, but may also be taken from any casting chosen at random. In the case of piston rings the samples shall be taken from the rings.

Dimensions and Tolerances. -7. The castings must conform to the drawings, and surfaces which are to be machined shall admit of finishing to the required dimensions without leaving evidence of the cast surface.

Packing, Shipping, and Delivery.—8. (*a*) The melt number or date of casting shall be cast on each casting.

(*b*) Castings shall be packed in boxes in such manner as to insure against breakage or injury to finished surfaces.

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[1] African mahonany (*Khayasenegalensis mahogoni*) is approved by the United States Signal Corps.

[2] National Hardwood Lumber Association rules, August, 1917, page 10, "Measurement." "In the measurement of lumber of random widths, fractions of over one-half foot, as shown on the board rule, must be counted up to the next higher figure; fractions of exactly one-half foot and less, as shown on the board rule, must be counted back to the next lower figure. Tapering lumber in standard lengths must be measured one-third the length of the piece from the narrow end."

AEROPLANE MECHANICS COURSE AT CITY COLLEGE

The College of the City of New York will shortly inaugurate a course in aeroplane mechanics, which will be under the supervision of Professor D. B. Steinman, C.E., Ph.D., Member, American Society of Civil Engineers; Member, Aerial League of America.

An informational course designed to answer the large and growing demand for draughtsmen, designers, and constructors in aeroplane factories and for pilots, observers and mechanics at the front.

The lectures cover the elements of the theory of flight and a descriptive study of aeroplanes, their design, construction and operation. The basic principles will be made clear by stereopticon views, photographs and models.

I. Introduction—Types of aeroplanes—The controls—Tractor and pusher biplanes—Monoplanes — Aeroboats — Nacelles and fuselages—Empennages.
   Review of elementary principles of mechanics and physics necessary for the study of aeroplanes—The gyroscope and its applications—Properties of the atmosphere—Automative stabilizers—Indicating instruments used in flight.
II. Theory of Flight — Air resistance — Streamline shapes — Inclined surfaces — Cambered surfaces—Lift and drift—Lilienthal's tangential—Aspect ratio—Centers of pressure—Elements of aerodynamic theory.
III. Aeroplane Wings — Characteristics of aerofoils—Suction on top face—Camber of upper and lower faces—Streamlining—Reserve curvature—Warping of aerofoils—Ailerons—Modification of shape—Characteristics of typical sections—Biplane effect—Staggering of planes—Dihedral and retreat—The tail planes.
IV. Characteristics of the Aeroplane—Angle of incidence—Decalage—Wash-out—Tail interference—Lifting capacity—Structural resistance—Drift—Power required at various speeds—Power available from the propeller—Gliding or volplaning—Climbing rate—Construction and use of characteristic curves—Lift and drift chart—Resistance chart—Power chart—Propeller chart—Engine chart—Fuel consumption and radius of action.
V. Design of Aeroplanes—Stresses in the wings and bracing—Spars and wires—Safety factors—Crystallization and fatigue—Detail of construction—Steel and other metals—Aeroplane woods—Wing covering—Assembly and adjustment.
VI. Aeroplane Motors—Internal combustion engines—Operating principles of two and four stroke engines — Efficiency — Engine parts and functions—Liquid fuels—Carbu-

(*Continued on page* 695)

THE FRIEDRICHSHAFEN BOMBING BIPLANE

A Report Issued by the Technical Department of the Department of Aircraft Production, Ministry of Munitions

(*Continued from page* 632)

Oil Pump

The main supply of oil is carried in sumps forming part of the base chamber. A secondary supply of oil, from which a small fresh charge is drawn at every stroke of the oil pump, is contained in a cylindrical tank supported by brackets from the engine struts, and placed immediately behind the radiator. This tank has a capacity of 25 litres = 5½ gallons. Each tank is furnished with a glass level, which is visible from the pilot's seat.

Petrol Tanks

The two main tanks which are placed, one under the pilot's seat and the other at the top rear end of the nacelle, contain 270 litres = 59½ gallons each, and are made of brass. Each is provided with a Maximall level indicator, which employs the principle of a float operating a dial by means of a cable enclosed in a system of pipes.

A hand pump is fitted conveniently to the pilot, and pressure is normally provided by the pumps installed in each engine. An auxiliary tank, holding approximately 13 gallons, is concealed in the upper main plane, not immediately over the nacelle but a little to the left side. This auxiliary tank is fitted with a level, as shown in Fig. 29, which is visible from the cockpit. The auxiliary tank appears to be used only for starting purposes. It is covered with a sheet of fabric held in position by "patent fasteners."

Engine Controls

Running from each engine to the nacelle is a horizontal streamline casing, containing the various engine controls. A section showing the arrangement of these inside the fairing is given in the sketch, Fig. 30. The leading edge of the streamline casing consists of a steel tube, to which are welded narrow steel strip brackets, to the rear end of which are bolted thinner strips which are hinged in front to the tube. The whole is then enclosed in a sheet aluminum fairing.

Through the leading tube passes the throttle control rod for each engine, the two throttles being worked either together or independently by the ratchet levers, shown in Fig. 31. These are mounted on a shelf convenient to the pilot's left hand. This control requires a considerable number of bell cranks and countershafts, but was noticeably free from backlash. The throttle is opened by the pilot pulling the levers towards him.

On the dashboard are two revolution counters and two air pressure indicators. The metal parts of these dials are painted red for the left engine and green for the right, and the same coloring applies to the magneto switches, one of which contains a master switch which applies to both magnetos on both engines.

Piping

The various systems of piping are distinguished by being painted different colors, thus the petrol pipes are white, arrows being also painted on them to show the direction of flow; air pressure pipes are blue, and pipes for cable controls grey.

Propeller

The propellers are made by the Luckenwalde Propellerwerke, Niendorf. Each propeller is 3.08 metres in diameter and is made of nine laminations, which are alternately walnut and ash, except one which appears to be of maple. The propeller has the last 20 ins. of its blade edged with brass. The pitch is approximately 1.8 metres and the maximum width of the blade 220 millimetres.

Controls

Only one set of control gears is fitted, but as pointed out, the seating accommodation is so arranged that any of the crew can take charge if, and when, necessary.

The elevator and aileron control is shown in sketch Fig. 32. It consists of a tubular steel pillar mounted on a cranked cross bar at its foot. The ailerons are worked by cables passing over a drum on the wheel, whence they descend through fibre quides on the cross bar to another wheel mounted on a countershaft below, from which they are taken along inside the leading edge of the lower wing and finally over pulleys up to the aileron levers on the top plane. The latter are partially concealed in slots let into the trailing edge of the wing. The upper and lower ailerons are connected by means of pin jointed tubular steel struts of streamline section.

It will be observed from Fig. 32 that a locking device whereby the elevator control can be fixed in any desired position is fitted, and consists of a slotted link which can be clamped by a butterfly nut to the control lever. This link is hinged to a small bracket attached to the panel below the pilot's seat.

Fig. 33 shows the rudder control, from which cables are taken over pulleys and through housings in the nacelle and finally to the end of the fuselage. The cranked rudder bar is of light steel tube and is arranged to be placed in the pivot box in either of two positions. It is furnished with light steel tubular hoops which act as heel rests and are adjustable. A locking clip is fitted on the floor of the cockpit so that the rudder can be fixed in its neutral position.

A novel type of trimming gear is an interesting item of the control. Movement of the elevator control from the normal upright position of the stick is made against the tension of one of two springs which can be alternately extended and relaxed by means of a winch connected to them, as shown in the diagram, Fig. 34. Normally these springs tend to bring the control stick back to a central position, in which the elevator lies flat, but if one of the springs is tensioned by winding up the winch in clockwise direction, the position to which the stick will tend to come when released will be such as to set the elevator at a positive angle. This winch gear, which is illustrated in Fig. 35, is mounted on the right-hand side of the nacelle, and is therefore under the command of the pilot's companion.

The crank is furnished with a locking pawl, which engages with a ring of small holes bored in the plate of the winch. The steel springs used in conjunction with this apparatus are some 3 ft. long and about ¾ in. in diameter. The inscription behind the winch read:—

Nose heavy—Right wind.
Tail heavy—Left wind.

Landing Gear

As might be expected, the landing gear on this machine is of massive proportions. Two vertical streamline section wood-filled tubes descend from the centre section wing spars, immediately under the engine, to a bridge piece or hollow girder made of welded steel. Through an oval hole in this girder a short axle carries two 965 mms. × 150 mms. wheels (38 in. × 6 in.). These work up and down against the tension of a bundle of steel springs about ½ in. in diameter and made of wire approximately 1-16 in. thick.

The steel girder is extensively pierced for lightness, and the edges of the holes are swaged inwards. The axle is prevented from moving sideways by plates, and is provided with short steel cables which act as radius rods and connect it to the front of the girder. The whole of the box girder is covered in with a detachable bag of fabric, which extends up to the small cross bar mounted immediately above the girder.

Mudguards are provided behind each landing wheel for the purpose of preventing any mud or stones dislodged by the wheels from coming in contact with the propellers.

From the front and rear of the box girder streamline tubes are taken to the ends of the main wing spars, where they abut against the nacelle, and these diagonals are further braced with streamline steel tubes. Both the vertical

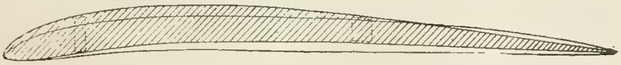


Fig. 10.

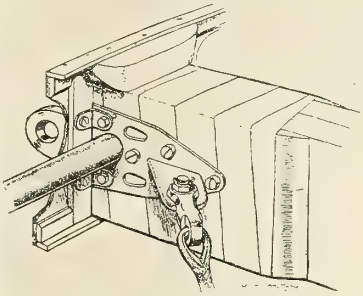


Fig. 9

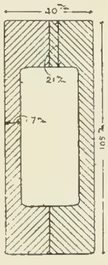


Fig. 11.

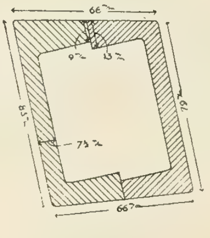


Fig. 12.

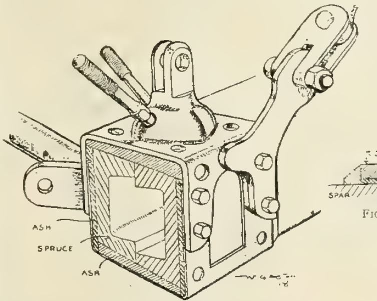


Fig. 14

Fig. 13

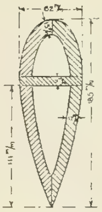


Fig. 15.

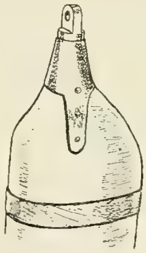


Fig. 16.

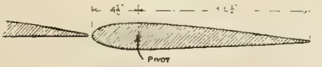
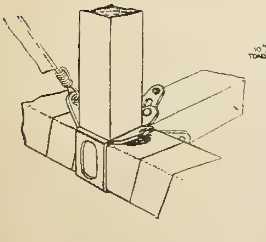
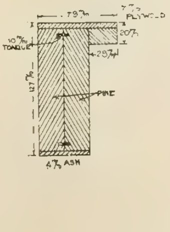


Fig. 17.





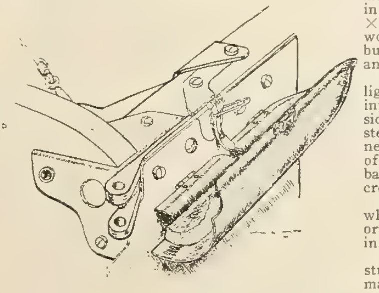


Fig. 19.

and diagonal tubes are held in split sockets so as to be easily replaceable if damaged.

In addition to the four main landing wheels, a fifth is mounted under the nose of the fuselage. This wheel is 760 mms. × 100 mms. (30 in. × 4 in.). It is mounted on a short axle, which is capable of sliding up and down slots in its forks against a strong coil spring, and it is also capable of a certain amount of lateral movement along its axle, also against the action of two small coil springs.

The tail portion of the fuselage is protected by a fixed skid made of wood but shod with a steel sole. This is fitted with a small coil spring contained inside the fuselage.

Wiring

The whole of the wiring system on the machine is very neatly carried out. There are three main systems; firstly, the ignition wiring, which is contained for the most part in tubes of glazed and woven fabric; secondly, the heating system, for which the wires are carried in flexible metal conduits; and, thirdly, the lighting system, in which a thin celluloid protective tubing is used. Wires are run from the nacelle along the leading edge of the upper planes to points level with the outermost strut. Here they terminate in a plug fitting placed behind a hinged panel. Apparently lamps are intended to be served by this circuit. Immediately in front of the pilot's seat a universally jointed lamp bracket is mounted on the outside of the nacelle. The exact purpose of this lamp is not known, as it could not illuminate any instruments.

Armament

Both the forward and rear cockpits are furnished with swivel gun mounts carrying Parabellum machine guns. These mounts consist of built-up laminated wood turntables working on small rollers, and carry a U-shaped tubular arm for elevation. This arm is hinged to a plunger rod working through a cross head, and arranged so that the arm is normally pulled down flat on the turntable by a coil spring. The plunger can be locked in any of a series of positions by means of a bolt operated by a hand-lever through a Bowden wire. A second lever allows the turntable to be locked at any desired point. A perforated sheet-metal shield protects the cross head and spring. Small shoulder pads are fixed on the turntables, of which that in the forward cockpit has a diameter of 2 ft. 10½ in., whilst in the rear the diameter is 3 ft. ¼ in.

The after-gunner is prevented from damaging the propellers by two wire netting screens, supported by tubular steel brackets, placed on either side of his cockpit. These are sketched in Fig. 36.

In addition to these two guns, provision is made for mounting a third in front of, and to the right of, the pilot's cockpit, where it could be managed by his companion. For this purpose a clip is provided immediately under the coaming of the nacelle, and the handle of this protrudes through a slot in the dashboard. The clip works on the eccentric principle, and appears to be self-locking. Its construction is shown in detail in Fig. 37.

A rack for Verey lights is mounted on the outside of the nacelle convenient to the pilot's companion.

INSTRUMENTS

Airspeed Indicator

Considerable interest attaches to the fact that this Friedrichshafen Bomber is the first enemy machine brought down which has been found provided with an airspeed indicator. This is of the static type, embodying a Pitot head of the usual type. The indicator has a dial of large size, and is altogether a much more bulky instrument than any for a similar purpose used in British machines. An investigation of its mechanism is being made.

Altimeter

This is of the usual type, reading to 8 kilometres.

Level Indicator

This is a somewhat crudely made device, employing two liquid levels, as indicated in the diagrammatic sketch Fig. 38. It will be seen that the reading gives the pilot an exaggerated idea of the angle of roll. The glass tubes are sealed up, and contain a dark blue liquid. One side of the dial is engraved Hängt links (Hangs left), the other Hängt rechts (Hangs right). The manufacturer is Arno Weisse, Berlin.

Revolution Counters

The dials give readings from 300 to 1,600 r.p.m. The sector between 1,300 and 1,500 is painted black, and these figures are marked with luminous compound, as also is the indicating hand. The manufacturer is Wilhelm Morell, Leipzig.

Air Pressure Gauges

These read from 0 to 0.5 kilogrammes per square centimetre. There is a red mark against

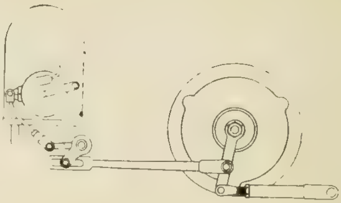


Fig. 24

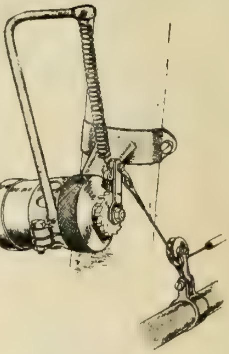


Fig. 25.

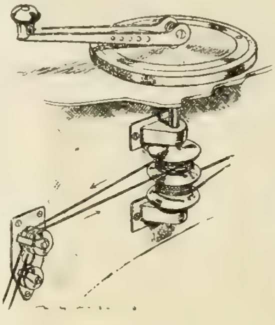


Fig 26

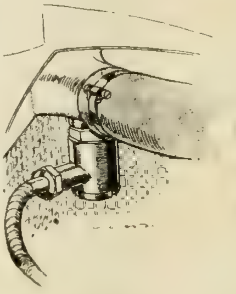


Fig. 27.

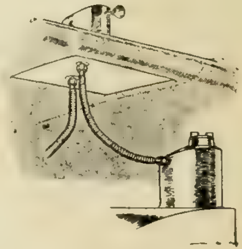


Fig. 28.

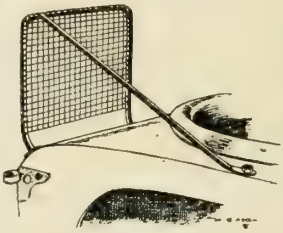


Fig. 36

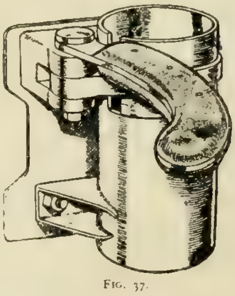


Fig. 37.

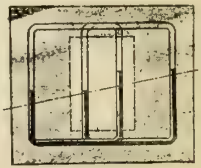


Fig. 38.

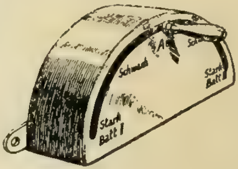


Fig. 39.

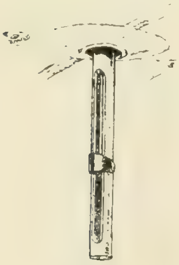
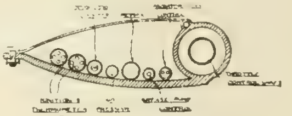


Fig. 23



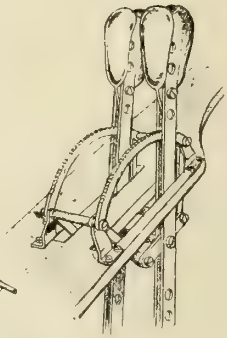
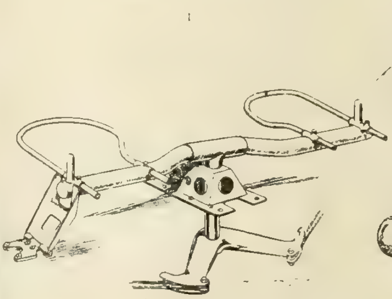


Fig. 31



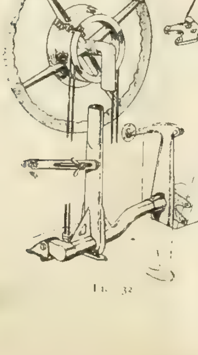


Fig. 32

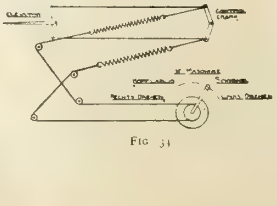


Fig 34

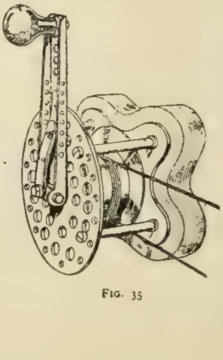
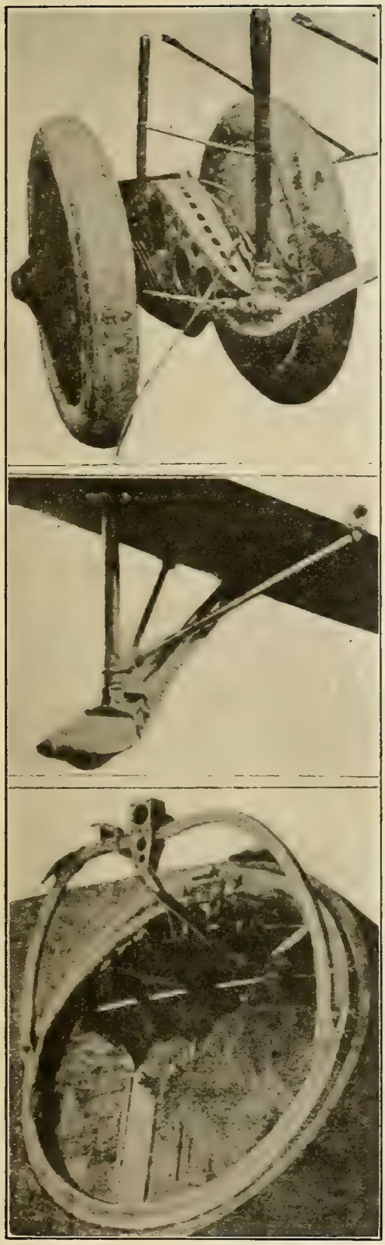


Fig. 35



Main landing chassis, tail skid and machine gun mounting in the front of the fuselage

the figure 0.25 kg. The manufacturer is Maximall Apparat Fabrik, Berlin.

Electric Thermometer Dial

This dashboard instrument consists of a box-type meter, the dial reading from 0 to 100 deg. C. The figures 0 and 75 are accentuated by red marks. A switch at the side of the box, having positions marked 1 and 2, allows the temperature of either radiator to be read.

Petrol Level Indicators

These are of the Maximall type, and employs a float immersed in a tubular guide in the tank. This float communicates its motion to a finger working over a circular dial, by means of a thin cord passing over pulleys. These are encased in pipes, which are under the same pressure as the tank.

Electric Heating Rheostat

This is illustrated in Fig. 39. It is marked Aus (off), Schwach (weak), Stark (strong). There are two separate resistance coils, enabling the rheostat also to perform the function of a change-over switch.

Wireless

The machine is internally wired for wireless, and the left-hand engine is provided with a pulley and clutch for driving the dynamo. Reference to Fig. 22 will show that this is designed to be mounted on a bracket carried by the outside front engine bearer strut, and that the engine fairing is moulded to receive it.

Bombs and Bomb Gear

At each side of the covered-in passage way in the nacelle are bomb racks capable of holding five 25-pounder (12 kg.) bombs.

Underneath the nacelle are carried two large tubular frames, fitted with cradles of steel cable, and furnished with the usual form of trip gear.

These racks would, it is believed, be capable of supporting a 300 kg. bomb a-piece. The bombs carried, however, evidently vary with the radius of action over which the aeroplane has to operate. The large racks are not permanently attached to the nacelle, but can easily be removed as required.

Inside the front cockpit from which the release of the bombs is conducted, there are seven triggers for the small bomb racks and two levers for the large bomb trips. The cables for this gear are carried under the floor, and are painted different colors for distinction.

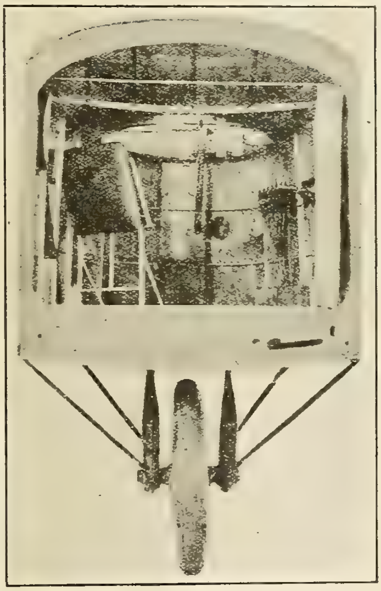
Bomb Sight

The bomb sight carried on the machine presents no new features, and is of the ordinary German non-precision type.

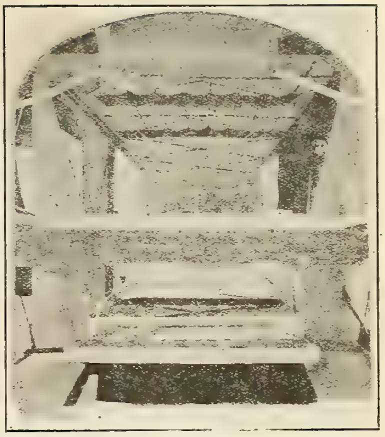
Fabric and Dope

Two entirely different kinds of fabric are employed in the Friedrichshafen machine. The wings are covered with a low-grade linen of the class which is employed on most of the enemy machines. It is white in color. Compared with that of British fabrics, the tensile strength is fairly good.

This fabric is covered with a cellulose acetate dope, and is camouflaged in large irregular lozenges of dull colors, including blue-black, dark green, and earth color.



The inside of the front cockpit



View looking down the inside of the fuselage, showing trap door and after-gunner's folding seat.

The other fabric, which is applied to the fuselage, tail planes, rudder, elevator fin, and landing gear, is apparently a cheap material, much inferior to British fabrics designed for a similar purpose. This fuselage fabric is dyed in a regular pattern of lozenges, the colors being hardly distinguishable from black. The dope is acetate of cellulose.

In both cases the dope seems to be carelessly applied.

Changes in Design

When compared with the Fdh. GIII., No. 177/17 (of 13/9/17), brought down by he French, this Friedrichshafen presents a few differences in detail design, amongst which the following points may be noted:—

(1) Engine fairing. In No. 177 spinners were mounted on the propeller bosses, and an aluminum ring of large diameter mounted on the rear extremities of the engine bearers in order to carry the rearmost fairing panels.

(2) Exhaust pipe. In the No. 177 this was, as in the present case, trumpet shaped and turned back at the end, but instead of a series of slots being used, the open vent was "bottled," so that the orifice was slightly restricted, and an additional circle of small holes provided.

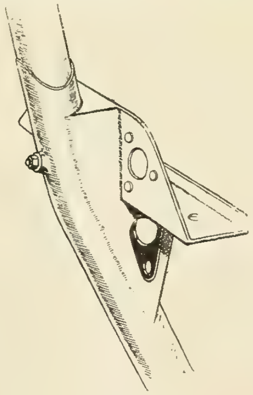


FIG. 21.

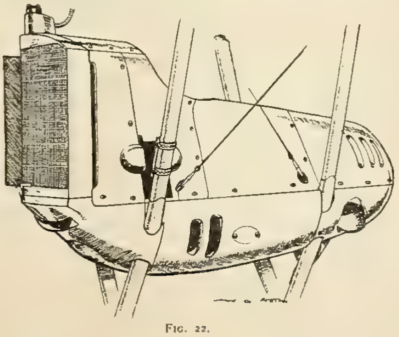


FIG. 22.

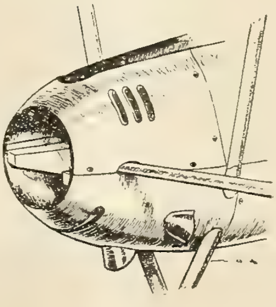
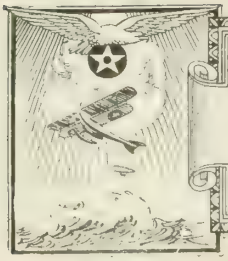
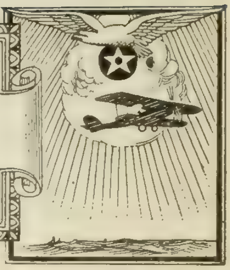


FIG. 23.



NAVAL and MILITARY AERONAUTICS



Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Spruce Division, Yeon Bldg., Portland, Ore.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to points named in order mentioned for temporary duty.

Note 2—Report to Capt. Paul B. Holmes, 870 Woodward Ave., Detroit, Mich.

Note 3—Report by letter to Director of Air Service, Washington, D. C.

Note 4—Report to district manager of inspection, 581 Woodward Ave., Detroit, Mich.

Note 5—Report to Signal Corps recruit depot, Fort Wayne, Mich.

Note 6—Report to 814th Depot Aero Squadron, Bustleton, Pa.

Note 7—Report at Madison Barracks, Sacketts Harbor, N. Y.

Note 8—Report to Chief of Staff, General Staff, Washington, D. C.

Note 9—Report to Balloon School A, Arcadia, Cal.

Note 10—Report to Maj. Gen. W. L. Kenly, Dept. of Military Aeronautics.

Note 11—Report to San Francisco, Cal., and then to Mather Field, Sacramento, Cal.; assume command. Report by wire to D. M. A.

Note 12—Report to Director of Aircraft Production, Washington, D. C.

Note 13—Report to Fort Wayne, Mich.

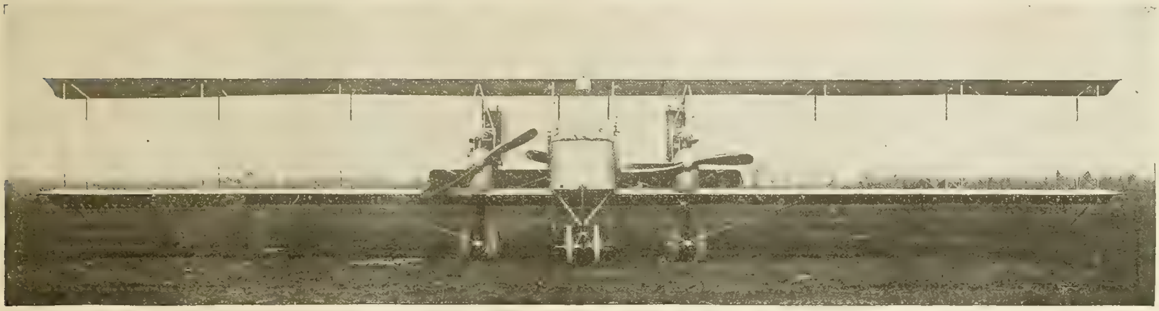
Special Orders Nos. 121 to 124, Inc.

A

Ayer, Carlton Sprague	SLR; CWT
Axley, Seth	TFT
Armstrong, Ralph S.	PFO
Appleton, Francis L.	EOT
Allen, Albert G.	EOT
Ammel, Roy W.	SLR; DIK
Atkins, Charles M.	SLR; DIK
Anglin, Charles H.	DIK
Ashe, Harry P.	BST
Abbott, Edwin Irving	SLR; GLC
Ames, Stanley Mitchell	SLR; GLC
Ames, Theodore G.	DIK
Atwood, Richard H	FRF
Andrews, Frank H.	FRF
Aleshouckas, Joseph W.	FRF
Avera, John William	SLR; ELA; FRF
Ault, Bryd Moore	SLR; VBW
Armour, Philip D.	DIK
Arnold, Harold D.	DIS
Ammerman, Karl J	FRF
Alton, Darrel Dow.	FRF
Appleton, Francis V. L.	FRF
Ainsworth, Cyril	SLR; KST
Aten, Courtney N.	FRF
Alexander, Robert Plunkett	SLR
Apple, Addison A.	SLR

B

Bailey, James Reade	SLR; LDT
Barrett, Vinton El	SLR; CRI
Burton, John F.	FRF
Bond, Wilmer K.	BST
Buell, Llewellyn M	CUI
Batts, Carl T.	SAG
Brokaw, John Abram	SLR; CRI
Bardens, William Marsh	SLR; KST
Brown, Edward A.	SLR; DIK
Bastow, Joseph G.	PFO
Brookley, Wendell H.	FRF
Butterworth, Benjamin T.	FRF
Braun, William P	DIK
Bower, Raymond G.	FRF
Bramhall, Maynard	LHV
Brewer, Percy O.	DIK
Bender, Ned J.	SLR; DIK
Bramlette, James L.	DIK
Brunner, Charles F.	DIK
Bach, Albert	DIK
Bush, Bradford S.	FRF
Barbee, Stanley N.	FRF
Baisley, Herbert K.	PFO
Beck, William McR.	FRF
Behel, Vernon W., Jr.	SLR; DIK
Booth, Harold W.	SLR; DIK
Brown, Edward	SMM
Brown, Ralph E.	SMM
Brown, Alvin M.	FRF
Brown, David K.	SLR
Browne, William G.	RTR
Barnes, Earl D.	FRF
Barnes, Harold L.	FRF
Baxter, James L.	KST
Baxter, Robert Knighton	SLR; DIK
Burge, Kemp Stucky	SLR; DIK
Bryant, Howard P.	FRF
Babcock, Howard P.	FRF
Butler, Morgan	CSO
Bragg, Ellis J.	FLR; VBW
Booth, Franklin O.	FRF
Baker, John H.	SMM
Breece, George Elmer	MJR; VBW
Bates, Lloyd	SLR; VBW



A twin-motored Italian Caproni biplane. (Italian Official Photo)

Betty, Lee Irby	SLR; VBW
Buckler, Douglas A.	CWT
Blackburn, Jack	SLR
Bogel, Calitizin Newton	SLR
Bolz, Adolph Charles	SLR
Bramlette, James Lee	SLR
Burr, Walter Andrew	SLR
Bader, Eugene Francis	SLR
Baker, Robert Horace	SLR
Baughan, Stephen Decatur Large	SLR
Barrett, William Joseph	SLR
Babcock, Harry Allan	SLR
Barksdale, Julian Neal, Jr.	SLR
Berglund, Eugene Nicholaus	SLR
Belsky, Charles James	SLR
Baukat, James George	SLR
Bell, Robert Wendell	SLR
Berger, Earl Osborne	SLR
Blanchard, George Kinson	SLR
Blount, Frederick Ripley, Jr.	SLR
Bond, Wilmer Krusen	SLR
Bruce, Parker	SLR
Bullard, Edward Lauriston	SLR
Burns, LeRoy Wilson	SLR
Burroughs, William McCaffrey	SLR
Butler, Roy J.	SLR
Butts, Daniel Edward	SLR
Balsinger, Ellis Corey	SLR; EOT
Barber, Edward Milton	SLR; EOT
Brokmeyer, Albert Fred	SLR; AAD
Bell, Alonzo Edwin	SLR; PMT
Baxley, James H.	FRF
Bilheimer, Earl L.	FRF; EOT
Bruch, Russell Lowerre	SLR; PMT
Bels, Adolph C.	DIK
Blair, Byron S.	DIK
Burr, Walter A.	DIK
Bogel, Galitsin N.	DIK
Blan, Ollie L.	DIK
Boutwell, Louis Evans	SLR; GLC
Beck, George C.	AGC
Burmeister, John C., Jr.	DIK
Bruett, William F.	TFT
Blackburn, James M.	DIK
Brady, Cletus J.	FRF
Bailey, Raymond L.	FRF
Barry, C. W.	SPD
Breggen, Wilhelm C.	FRF
Eaker, Kenneth C.	FRF
Bates, John H.	FRF

C

Carpenter, Earle J.	EOT
Cohen, Abraham P.	EOT
Cottrell, Roy W.	EOT
Crane, George A.	EOT
Chappell, Alfred B.	UIU
Clark, John E.	FRF
Cull, Edwin E.	DIK
Cox, Artie G.	SLR; KST
Christie, Donald C.	SLR; DIK; FRF
Costar, Lloyd	DIK
Corsant, Jessie H.	DIK
Cutter, Charles E., Jr.	PFO
Conrad, Max H.	PFO
Chapman, William V.	TFT
Codington, Arthur D.	DIK
Chase, Paul W.	TFT
Cole, Robert A.	SLR; DIK
Cameron, Burr S.	FRF
Clauss, Albert Frederick	SLR; ELA
Cooper, Lane Reed	SLR; EOT
Cottingham, Kenneth	OSU
Chapman, Edgar E.	FRF
Cook, William L. S.	SLR; DIK
Clark, Clinton Wesley	SLR; CWT
Cook, Everett R.	FRF
Corner, William B.	SMM
Clelland, Stanley H.	RTR
Corsant, Jesse H.	SLR; FRF
Crittenden, William Robert	SLR; DIK
Clarvoe, Frank Auld	SLR; SPD
Chaddock, Homer Lester	SLR; KST
Calkins, Reginald J.	DIK
Cortright, Edgar M.	SMM
Chambers, Stuart M.	TFT
Chance, Percival H.	DIK
Cleveland, Lyman W., Jr.	FRF
Coffman, Beirne H.	FRF
Crowne, Irving H.	FRF
Coon, Sylvanus C.	MAT
Campbell, Walter Melville	SLR; PMT
Cauthen, James Carlisle	SLR; CAF
Callaway, Richard E.	TFT
Cline, Harold Verne	SLR; RWT
Codington, Arthur D.	FRF
Cargo, Hugh G.	FRF
Cottrell, Clifton C.	FRF
Carley, Harry G.	FRF
Christenson, Jens Tinus	DIK
Claude, Laurens	SLR; DIK
Carrigan, Robert M.	FRF
Cutter, Edward B.	TFT
Cone, Charles L.	DIK
Clark, Franklin W.	FRF
Carscadin, Henry L.	DIK
Clark, Arthur Tillotson	SLR
Cull, Edwin Emory	SLR
Cone, Charles Luther	SLR
Campbell, Rudley Rhodes	SLR
Chaffee, Robert Norton	SLR
Coffman, Lionel Alton	SLR
Campbell, Robert Burns	SLR

D

Decker, Kenneth Neilson	SLR; LDT
Denny, Hugh Roy	SLR; KST
Dreyfuss, Albert Milford	SLR; KST
Dede, Alexander L., Jr.	SGS
Doerr, William	LHV

An observation outpost in the environs of Paris, observing enemy aircraft and warning the defenders of the city of their approach. (French Official Photo)

French Nieuport machines lined up for inspection at an American aviation school in France. (British Official Photograph)

DeNoyelles, Harold E.	DIK
Dayton, Frank E.	TFT
Denie, George R.	PFO
Drennan, Leonard H.	RSD; TFT; PFO; FOB; CSO; Note 1
Deuel, Thorn	TFT
Dohr, James Lewis	SLR; CSO
Des Champs, James Wilcox	SLR; CAF
Doering, Harold	DIK
Davis, Edwin Kent	SLR; PMT
Edwards, Idwal H.	FRF
Dixon, Edwin Malcolm	SLR; PMT
D'Autremont, Hubert H.	FRF
Dooley, Thomas W.	FRF
Deutsch, Lee	WFO
Davies, William T	RTR
Day, John George	SLR, VBW
Dickman, Frederick T.	FRF
Doty, David Ellis	SLR; DIK
Dillaway, Manson M.	FRF
Davidson, Edward C.	FRF
Dawson, Charles B.	AGC
Dean, Henry H.	TFT
Denie, George R.	FRF
Dickson, David C.	FRF
Dutton, Reece T.	RTR
Doggett, William K.	KST
Draper, Harold Dieckmann	SLR
Dyche, Justin Kimber	SLR; DIK
Denmark, Leonidas P.	SMM
Draper, Harold D.	DIK
DeNoyelles, Harold E.	FRF
Day, Curtis La Q.	SLR
Dewey, Robert Adelbert	SLR
Donovan, John Columbus	SLR
Drake, Joseph Horace, Jr.	SLR
Dake, Robert Edward	SLR
Daniels, William Charles	SLR
Dodds, Harry	SLR
Davis, Dalphin Alston	SLR

E

Eglin, Frederick I.	MAC
Elliott, John S.	UTA
Elliott, Irl J.	SLR; DIK
Everett, Edward C.	EOT
Ewing, Hugh W.	EOT
Erdmann, Robert W.	KST
Ellis, Richard W.	TFT
East, John H.	TFT
Eidson, Charles G.	MAT
Erhard, Ursinus Zachery	SLR
Ellett, Alexander	SLR
Elliott, Edward B.	FRF
Elliott William J., Jr.	SMM
Everett, Aylett L.	DIK

F

Fairman, Earl T.	EOT
Frick, Childs	SMM
Feasel, Fred	BST
Fraser, Frank William	SLR; EOT
Fickel, Jacob E.	RSD
Frothingham, Newton S.	FRF
Finlay, George D., Jr.	PUP
Farrar, Delwin B.	SLR; DIK
Forshey, Fred W.	UTA
Fowler, Louis F.	SLR; DIK
Foster, Esty	PFO
Fish, Frederick L.	FRF; PFO
Ferguson, George F.	SLR; DIK
French, Samuel L.	SLR; DIK
Frost, John A.	DIK
Fosnight, Reed O.	KST
Fuller, Willard P.	WFO; SBI; MAT; Note 1
Ferry, Clinton Sumner	SLR; GLC
Fish, Eugene R.	FRF
Fitzmaurice, William J.	MAT
Fisher, Randolph Ridgely	SLR; KST
Friend, Wilson B.	RTR
Freedman, Mark A.	SLR; EOT
Fox, Arthur William	SLR; CWT
Freeman, Charles M.	DIK
Fulwiler, Howard D.	DIK
Frankfort, Frederick	SLR; DIK
Foster, William Chapman	SLR
Fuller, Leonard Beeman	SLR
Fulton, Richard Wallace	SLR
Falcon, Guilford Ward	SLR
Faust, Thomas Carlyle	SLR
Flynn, Mortimer Gheens	SLR
Fowler, Lester Albert	SLR
Frank, Norman Daniel	SLR

G

Grazier, Oliver E.	DIK
Graham, Maurice F.	TFT
Goss, Lewis W.	PFO
Gross, Edward H.	FRF
Ganey, Daniel F.	FRF
Gause, George E.	FRF; EOT
Gill, Hamilton A., Jr.	EOT
Giddings, Lee C.	FRF
Goldie, William B.	SLR; DIK
Gandy, Robert L.	SLR; DIK
Gormley, Richard R.	SLR; DIK
Givens, James D.	DIK
Gilbert, Mager V.	RTR
Gilchrist, David H.	RTR
Gile, Leroy G.	RTR
Grimm, Clarence G.	RTR
Griffin, Howard P.	FRF
Gude, Adolph E.	FRF
Gale, Harold De Forrest	DIK
Gray, Ralph C.	DIK
Garrett, John W.	DIK
Gaalaas, Rudolph L.	SMM
Gastreich, Joseph W.	SMM
George, Harold L.	FRF
Gadbury, Joseph H.	KST
Gilbreth, Florian R.	KST
Gilman, Benjamin Henry	SLR; VBW
Gartz, Adolph F., Jr.	FRF
Gallagher, Joseph J.	FRF
Garey, Rayner	DMA
George, Marshall W.	DIK
Garroni, Rudolph	DIK
Garratt, Harold C.	AGC
Garrett, Joseph Robert	SLR; DIK
Giddings, Joseph Atwood	SLR; DIK
Gilman, Harold Abrams	SLR
Glanz, Carl Christian	SLR
Cowans, John	SLR
Gutzler, Raymond William	SLR
Griffin, Norwood	RTR
Glos, Walter Adam	SLR
Gouverneur, Fairfax Heiskell	SLR
Gray, Will Klapp	SLR
Graham, Arthur Seesums	SLR; DIK
Grimm, John Edward, Jr.	SLR

H

Harrigan, Leon J.	FRF
Hayden, Thomas H.	FRF
Herrmann, Gerald F.	DIK
Haggerty, Stewart Anthony	SLR; LDT
Hall, Robert K.	BST
Higgins, Charles C.	EOT
Hinckley, Nelson C.	EOT
Henderson, John Sailer	SLR; LDT
Harrison, Landreth M.	PFO
Hoisholt, Arne K.	TFT
Hofflund, John L.	TFT
Haskins, George William	SLR; CWT
Harris, Benjamin T.	PFO
Hegan, Chester P.	PFO
Hillix, Albert F.	SLR; DIK
Holmlund, Gilber Emanuel	SLR; KST
Hopkins, Ward D.	SLR; DIK
Hardie, John F.	SLR; DIK
Hackedorn, Hillis F., Jr.	SLR; DIK
Harrigan, Cornelius Herbert	SLR; CWT
Hicks, John	SLR; GLC
Hanley, Harold Robinson	SLR; PMT
Harrison, Elbert Iredell	SLR; KST
Horne, Ernest Grover	SLR; RWT
Hilliard, Thomas J.	ASM
Howard, Alfred M.	DIS
Harris, Theodore	FRF
Huttig, William	SLR; KST
Herring, Lloyd H., Jr.	FRF
Higgins, Charles C.	FRF
Hunt, John L.	FRF
Holmes, Elmer M.	FRF
Ha'ley, Gregory Leo	SLR; EOT
Heltzen, William S.	FRF
Hahn, Ralph W.	RTR
Hicks, Charles C.	SMM
Holmes, Raymond M.	KST
Harris, Joseph M.	Note 9
Howk, Clarence L.	DIS
Hamann, William P.	DIK
Harmon, Frank H.	FRF
Higbee, Walter F.	MAT
Hunt, Spencer S.	AGC
Houser, Paul F.	AGC
Holmes, George C.	FRF
Hinman, Donald M.	AGC
Huber, Howard F.	FRF
Haywood, Oliver C.	DIK
Hardman, James U.	RTR
Hurd, Mark M.	FRF
Hurd, Volney D.	FRF
Halpin, John Henry	SLR
Ham, Mark Neely	SLR
Hamilton, Pierpont Morgan	SLR
Hanson, Stanwood Lincoln	SLR
Harper, Oliver Clifton	SLR
Harvey, Harold Mellor	SLR
Heine, Bernhardt Edward	SLR
Heltzen, William Stanley	SLR
Hendricks, Walter	SLR
Hewitt, Robert Penrose	SLR
Hill, Edward Hugh	SLR
Hirshfield, Ira Wilson	SLR
Hiscock, Thorp	SLR
Hofstetter, Carl Frederick	SLR
Hone, Charles Byron	SLR
Hoyt, Fred Day	SLR
Huffman, Carl Fountain	SLR
Hamann, William Paul	SLR
Hansen, James Henry	SLR
Heywood, Oliver Charles	SLR
Hoadley, George, Jr.	SLR
Hyde, Gordon Eugene	SLR
Hallem, Harry	SLR
Hand, Julius Mills	SLR
Hawley, Herbert	SLR
Houser, Percy Thomas	SLR
Henry, Harold H.	RTR
Haust, Charles E.	FRF
Hale, Herbert J., Jr.	TFT
Hamilton, John R.	DIK
Hays, William W.	DIK
Hughes, Francis F.	FRF
Hopkins, John H.	RTR

I

Ivins, Maurice H.	LHV
Illges, Abraham	LHV
Isbill, Paul Martin	SLR; RWT
Illett, Edward Wilson	SLR
Ingraham, Forrest Ward	SLR; CWT

J

Jones, Stanley Burdette	SLR; LDT
Jones, Nathaniel R.	MAC
Jones, Reginald L.	DIS
Jones, Leland S.	FRF
Jones, Lawrence M.	FRF
Jones, Elmer Hugh	SLR; DIK; FRF
Johnson, Leonard H.	Note 12
Johnson, George Stevens	SLR; PMT
Johnson, Everett B.	DIK
Johnson, Clare Thomas	SLR
Johnston, John W.	FRF
Jackson, Paul C.	FRF
Jackson, John S.	KST
Joscelyn, Douglass L.	FRF
Jaynes, John B.	DIK
Judge, Joseph B.	DIK
Jacobson, Chester J.	FRF
James, John R.	SLR
Jenkins, Nelson Durfee	SLR
Jenks, Henry Irving	SLR
Jensen, Charles C.	FRF

K

Kauffman, Carl Ruby	SLR; DIK
Keeling, Walter Sherman	SLR
Kelly, Bernard Edmund	SLR; DIK
Kelly, Oakley George	SLR
Kiefner, Charles Edward	SLR
Kinney, Judson Stevens	SLR; DIK
Kuhn, Leo Warren	SLR
Kilbane, James Anthony	SLR
Kennedy, Carl Francis	SLR
Kent, Thomas Thatcher	SLR
Kenly, Henry C.	PUP
Kenly, William L.	PUP
King, John Hollis	SLR; VBW
Kernan, William F.	FRF
King, Alfred F., Jr.	FRF
Krotzer, Henry W.	FRF
Kesemann, William, Jr.	SLR; EOT
Kenny, Raymond	DIK
Kanzler, Frederick C.	RTR
King, Harold W.	RTR
Keeling, Walter S.	FRF
Kelcey, George Guy	SLR; FRF; GLC
Kilroe, John C.	SLR; FRF; DIK
Kyle, William F.	DIK
Keith, Jerome	DIK
Krigger, Augustus H.	AGC
King, Ned E.	AGC
Kinney, Wallace Elliott	SLR; AAD
Keller, Frederick W.	FRF
Kritzer, Henry E.	FRF
Kohler, Carlos C.	DIK
Koehler, Herbert O.	TFT
Kent, Thomas T.	DIK
Kirkendall, Freeman B.	FRF
Kilbane, James A.	DIK
Krieger, John E.	FRF
Kibbe, Gordon M.	SMM
Kresge, Ellwood F.	PFO

L

LeDoux, Andrew P.	FLR; VBW
Lankey, Francis Irving	SLR; CWT
Lane, Herbert Vaughan	SLR; GLC; FRF

Lebensberger, Edgar Berger	SLR; GLC; FRF
Karkin, Edward James	SLR; GLC; FRF
Lynch, Harry H.	BST
Leohner, William E.	RTR
Lake, Harley W.	DMA
Long, Winfred T.	EOT
Long, William F.	FRF
Leonard, Cecil E.	DIK
Loudenback, Martin V.	KST
Lesley, Herbert	SLR; KST
Livesay, George Byron	SLR; CAF
Lindsay, Oliver Christian	SLR; PMT
Lobdell, Jacob K.	FRF
Lovelace, Lake	FRF
Laureni, Fred C.	RTR
Lamar, Gresler H.	RTR
Lundgren, Theodore S.	DIK
Lyon, Peyton B.	FRF
Lawson, Russell Herbert	SLR; VBW
Lockwood, Lyman B.	AGC
Lewis, Hobart H.	TFT
LeBrou, Richard K.	FRF
Larson, Westside T.	DIK
Lanman, Ludlow T.	FRF
Longstreet, Jack Y.	AGC
Lyons, Philip T., Jr.	FRF
Lewis, Richard P.	FRF
Lindsay, Gordon J.	EOT
Leferink, Richard	SLR
Liggett, Arthur George	SLR
Lesley, Hubert	SLR
Larson, Westside	SLR
Lewis, David Everett	SLR
Lawrence, Almon Rowell	SLR

M

Merrick, Bentley Almerin	SLR; GLC
Madden, John Henry	SLR; CAF
Machle, Jerome Benjamin	SLR; PMT; FRF
Myers, Maurice C.	SMM
Macomber, Henry W.	LHV
Moss, Harry S.	LHV; FRF
Morthland, Merle A.	LHV
Milburn, George Jackson	SLR; PMT
Meyer, Emil Albert	SLR; EOT
Moss, Douglas Rogers	SLR; EOT
Meredith, Evan K.	RTR
Mader, Luther P.	FRF
Morgan, Herbert P.	DIK
Morsch, Jesse J.	DIK
Mayo, Robert C., Jr.	LHV
Mathews, James Christopher	SLR; RSD
Mollison, James Alexander	SLR; RSD
Moore, John Sutherland	SLR; RSD
Moore, Ralph Jacobs	CPR; Note 4; WCS
Mersereau, Harrison Irving	SLR; VBW
Mahoney, Lawrence E.	FRF
Marvin, Arthur B.	FRF
Mitchell, Donald H.	DIK
Meany, Philip J.	SMM
Mixter, Samuel	PUP
Mulhall, Joseph Crawford	SLR; VBW
Marsh, Gerald Gilbert	SLR; PMT
Moore, Charles C., Jr.	DIK
Minter, Clark C.	SLR; DIK
Murphy, Charles F.	FRF
Mackie, Robert Francis	SLR; EOT
Merrill, Patterson Davy	SLR; EOT
Minshall, Robert	FRF
Meyer, Carl D.	RTR
Metcalfe, John W.	EOT
Mook, Samuel R.	EOT
Murphy, Cyrus W.	EOT
Mulcahey, Edward P.	SLR; DIK
Maxwell, Robert R.	SMM
McDonough, Harry L.	TFT
Meeker, Nathaniel H., Jr.	FRF
Moody, Alvah E.	LHV
Morrow, Clifford K.	FRF
Merritt, Edward K.	AGC
Morse, Eugene D.	PFO
Morrow George D.	DIK
Moores, Kenneth A.	DIK
Martel, Alfred, Jr.	DIK
Michels, Joseph S.	TFT
Moon, Odas	SLR
Mitchell, Donald Harlow	SLR
Moore, David Harris	SLR
Matzger, Carlisle Leland	SLR
Miller, Walter Lewis	SLR
Moran, John Lally	SLR
Munchhof, Theodore Joseph	SLR
Maynard, Kenyon Cushing	SLR
Mahan, William Joseph	SLR
Moore, Julian E.	SMM
Morris, David R.	TFT
Mathews, David R.	DIK
Magee, David W.	FRF
Miller, Walter	FLR; HHN

Mc

McGovern, John Francis	SLR; VBW
MacNiel, Bruce	SLR
McFarland, John Joseph	SLR
McGrath, Michael Francis	SLR
McMurphey, John William	SLR
MacIver, Clarence Roscoe	SLR
McBride, Howard Inman	SLR
McClelland, Harold C.	FRF
MacKenzie, Clifford R.	FRF
McFarland, Frank H.	TFT
McDonald, George Clement	SLR; RWT
MacDonald, Harold F.	RTR
McKittrick, Peter W., Jr.	AGC
McDonough, Hubert Boniface	SLR
McChesney, Samuel H.	TFT
MacAshbill, Burdette	RTR
McKenney, Samuel Mortimer	SLR; RWT
McKay, Edgar John Warink	SLR; EOT
McCaffrey, James Augustine	SLR; GLC
MacKenzie, Clifford Royal	SLR; GLC
McGhee, Abner F., Jr.	FRF
McDonald, Hunter	SMM
McNamara, John C.	RTR
McCarron, William C.	SMM
McDonald, Samuel F.	DIK
McConacjie, Max	FRF
McMurphey, John W.	DIK
McBride, Howard I.	DIK

N

Norris, John Langdon	SLR; CWT
Nelson, Roy A.	FRF
Neubauer, George Roberts	SLR; KST
Neubig, Earl E.	BST
Noonan, George Carroll	SLR; EOT
Naumann, Arthur P.	LHV
Nutter, Farr	SLR; EOT
Nunenmacher, Francis W.	DIK
Newberry, Arthur C.	RTR
Newman, Augustus L.	LHV
Night, William J.	TFT
Nims, Homer W.	DIK
Nicholl, John V.	RTR
Norris, John L.	DIK
Newcomb, Frank H.	RTR
Noble, William H.	FRF
Nolan, Thomas J.	SMM
Niblack, Polk H.	FRF
Norton, Harrison Edson	SLR

O

Olson, Carl N.	FRF
Oliphant, Rufus Alexander	SLR
Osgood, William Thompson	SLR; VBW
Orr, John C.	TFT
Orr, Dale	SLR; RSD
Olds, James H. S	BST
Olds, Milford Hixon	SLR
Ormsbee, Eugene R.	RTR
Oliver, Ralph A.	SMM
O'Shea, Edward Marshall	SLR
O'Connor, Thomas Francis	SLR; EOT
O'Brien, James H.	FRF
O'Brien, John J.	RTR
O'Malley, Joseph J.	FRF

P

Preisch, Herbert Edmund	SLR; VBW
Petticord, Leslie Lewis	SLR; CAF
Pearce, Henry G.	Note 5
Partridge, Joseph Arlington	SLR; GLC
Prish, Cheaney L.	BST
Payne, Bryan W.	BST
Pilatsky, Louis	DIK
Phipps, George R.	CUI
Parker, J. Brooks B.	REL; Note 8
Parish, William Love	SLR; EOT
Parshall, Raymond P.	FRF
Parsons, Frederick C.	FRF
Peterson, James H.	FRF
Pollister, Raymond S.	RTR
Pennington, Jerome E.	DIK
Prime, Charles P.	RTR
Peters, Sidney V. W.	TFT
Poindexter, Earl W., Jr.	SMM
Pascale, Harry	FRF
Picklesimer, Bryant H.	SLR; VBW
Pennewill, John M.	DIK
Pardridge, Clinton E.	LHV
Pickrell, Floyd M.	TFT
Palmer, Hubert P.	DIK
Pinkstaff, Everett W.	SLR; DIK
Patterson, Robert A.	TFT
Parker, Harold W.	FRF
Perry, William L.	FRF
Pyke, Robert W.	FRF
Pruter, Frederick	TFT
Palmer, Franklin H.	FRF
Pedler, Harry W.	SLR; DIK
Price, Kenneth T.	FRF
Pilcher, Rufus J.	SLR; DIK
Paulson, Carl F.	FRF
Pitrate, Charles Stuart	SLR
Paige, William Julius	SLR
Pennington, Jerome Edward	SLR
Phelps, Samuel Bixby	SLR
Poleman, Thomas Theobold	SLR
Prosser, Frank Hallam	SLR
Post, John Hawthorne	SLR
Potter, James Harold	SLR
Proctor, Willis Heath	SLR

Q

Quaintance, Charles Linsley	SLR
Queen, Harold Ellis	SLR
Quayle, Fred A.	RTR

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Hydroaeroplanes on the beach at the Key West Naval Aviation Station, Florida

FOREIGN NEWS

FRANCE

The French official announcement for June 3rd reports successful aerial combats and extended bombing operations. The text of the announcement follows:

"Our aviators continue to be very active. During the days of the 1st and 2nd of June they made, with their usual spirit, journeys of reconnoissance, observations, and chase. Twenty-nine German aeroplanes were brought down, twenty-four were compelled to land out of control, and four captive balloons were shot down.

"Our bombarding squadrons have increased their activity over the entire battlefront. One hundred and thirty tons of explosives have been dropped on convoys, assembling centers, and bixouacs occupied by the enemy, notably in the region of Croucy, Soissons, Vierzy, Villers-Helon, Neuily-St. Front, and La Fère-en-Tardenois.

On the 1st and 2nd four other German machines were destroyed by our anti-aircraft guns."

The French official for June 4th says:

"On June 3rd our bombing escadrilles, forcing a passage of the enemy lines, brought down two enemy aeroplanes. Three other aeroplanes and two captive balloons were brought down by our pursuit machines. The same day twenty-one tons of projectiles were dropped on marching troops, artillery columns, and revictualing convoys. On the same objectives twenty-eight tons were dropped on the night of June 3-4.

"On June 4, in the course of a double expedition in the valley of the Savieres, our bombing escadrilles dropped more than seventeen tons of projectiles on enemy concentrations, which were completely dispersed. On the night of the 4th about fourteen tons of explosives were dropped on the railway stations at Fismes, Fère-en-Tardenois, Roye and Bohain.

"Four enemy machines were brought down and two captive balloons burned. An enemy machine on a grand model, having four motors, was brought down on the night of June 1-2 in the region of Nanteuil-le-Haudouin. Its crew of eight men was made prisoner."

On June 5th nineteen enemy aeroplanes were brought down or forced to land out of commission. A German captive balloon was burned. The same day and the following night twenty-five tons of explosive were dropped by our bombing machines on the cantonments, depots, railway stations and convoys in the enemy zone. A great fire followed by explosions was observed in the station at Fère-en-Tardenois.

Allied air raids on Trevis last Saturday, killed two persons and injured four, according to a despatch received from Coblenz today. Most of the bombs fell in the fields.

German aeroplanes raided the Paris district on June 7th through a heavy defensive barrage. Some bombs were dropped.

One person is reported dead and several wounded. Material damage was done.

The "all clear" signal was sounded at 12:20 a. m. Friday.

German aeroplanes during recent raids on Paris have made use of an illuminating device which is a combination of a rocket and a clock movement. The bomb is dropped, and when it explodes it releases a linen parachute provided with a cartridge containing a substance with a magnesium base.

This substance is lighted automatically 300 to 400 meters above the ground, and for two minutes projects an extremely bright light over objects below it. The German aviators have carried out their bombing operations with the assistance of this light.

GERMANY

The Berlin announcement for June 3rd says that 31 Allied aeroplanes were shot down.

The German official for June 6th as regards aviation says:

"During the last two days forty-six aeroplanes and four captive balloons have been brought down. Richtofen's chasing squadron shot down fifteen enemy aeroplanes yesterday."

GREAT BRITAIN

The official report on aerial operations of June 3rd says:

"Yesterday our aeroplanes carried out a good deal of observation for the artillery and took many photographs. Eighteen tons of bombs were dropped by our aeroplanes, and heavy machine gun fire from the air was directed upon a great variety of targets.

"Eight German machines were destroyed in air fighting, and fourteen were driven down out of control. Three of our machines are missing.

"On Sunday night we bombed Le Cateau, St. Quentin, and Valenciennes railway stations and dropped eight tons of bombs. All our night-flying machines returned."

The British official communication dealing with aerial operations issued June 4th says:

"There was less activity in the air yesterday. There was some reconnoissance and photographic work carried out, and in the course of the night a total of eighteen tons of bombs was dropped by our aeroplanes. The targets chiefly attacked were the railway stations at St. Quentin, Douai, and Luxemburg.

"Three hostile machines were brought down in air fighting, and one was driven out of control. None of ours is missing."

The communication dealing with aviation issued June 5th was:

"The weather was overcast on the British front yesterday and the enemy's aircraft were not active. One hostile machine was brought down by our aeroplanes and another driven down out of control. One German balloon was destroyed.

"Besides reconnaissance work and artillery co-operation we dropped during the day and night fourteen tons of bombs; we lost no machines."

London, June 6.—The British official communication dealing with aviation issued June 6th says:

"Wednesday night our long distance bombing machines again attacked the Metz-Sablons station triangle and also the railway sidings at Thionville, dropping five tons of bombs with good results, although the visibility was indifferent. Thursday morning the railway station at Coblenz was heavily attacked by us. Good bursts were observed on the railway line. All the machines emerged safely.

"The fine weather of Wednesday enabled our airmen to carry out much photographic, reconnaissance and artillery work. twenty tons of bombs were dropped on different targets, including hostile dumps and railway billets, the Armentieres and Roye stations and the Zeebrugge seaplane base.

"In addition our long distance day bombing machines heavily attacked the railway station and barracks at Treves and the Metz-Sablons railway station and the railways at Karthaus, returning without loss.

"Seven hostile machines and three German observation balloons were shot down during the day by our airmen and three hostile aeroplanes were driven down out of control. Four of our machines are missing.

"Wednesday night thirteen tons of bombs were dropped by us on the St. Quentin, Boesinghe, Cambrai and Armentieres stations. All the machines returned."

The British official communication concerning aviation operations says:

"Our airmen took advantage of the fine weather on the British front Thursday to accomplish much useful work in reconnaissance and photography. Together with our observation balloons, they ranged our guns on many hostile batteries.

"In air fighting fourteen German machines were destroyed and eight others were driven down out of control. Several observation balloons were destroyed by our airmen and another hostile aeroplane was forced to descend by our anti-aircraft fire.

"During the day we dropped twenty-eight tons of bombs and a further eleven tons in the course of the following night. Among the targets attacked were Valenciennes, Le Cateau, Busigny and the St. Quentin railway station.

"We lots one machine during the day."

London, June 8.—Aerial operations by the British are described in an official statement issued to-night as follows:

"In the air a good deal of observation and photographic work was carried out by us on June 7. Bombing was active on both sides. We dropped twenty-three tons of bombs on railway junctions, aerodromes, and dumps beyond the German lines.

"Twelve machines were brought down by our airmen, and seven were driven down out of control. We lost three machines."

London, June 9.—The official report on aerial operations issued this evening says:

"Low clouds hampered work at Saturday, but our aeroplanes constantly attacked the enemy behind his lines with machine gun fire. Our squadrons, co-operating with the French, heavily bombed Nesle and Fresnoy-les-Roye, nine tons being dropped.

"During the following night two tons were dropped on a railway station and dump east of La Basse.

"In the course of twenty-four hours four hostile machines have been brought down and tw oothers disabled. None of ours is missing."

On June 3rd the British Admiralty issued an official communication regarding aerial operations, the text of which follows:

"During the period of May 30th to June 2nd, inclusive, bombing raids were carried out night and day against the following military objectives: Bruges and the docks of Zeebrugge and Ostend. Several tons of heavy bombs were dropped on the objectives with good results. Photographs confirm great damage to the large engineering works at Bruges.

"Three enemy machines were brought down in flames and three driven down out of control. Three of our machines are missing.

"In home waters during the above period numerous anti-submarines and escort patrols were carried out and long reconnaissances were made across the North Sea. Submarines were sighted and attacked, and enemy mines were located on several occasions.

"During a North Sea patrol a Zeppelin was sighted and chased by our seaplanes, which were unable to get sufficiently near to engage her effectively. One of our seaplanes is missing."

A review covering naval aerial operations during the period from June 3 to 5 has been published by the Admiralty.

"Eight bombing raids," it says, "have been made on the following military objectives: Zeebrugge, Ostend, Bruges, and the Thourout railway junction. Large quantities of heavy bombs were dropped. In the course of aerial fighting two enemy machines were destroyed and three driven down out of control. One of our machines is missing.

"In home waters during the same period escort duties and anti-submarine patrols were carried out. Submarines were sighted and attacked and enemy mines located on several occasions.

"A squadron of glarge seaplanes carried out a long reconnaissance over the North Sea. A large formation of hostile machines was met and engaged, resulting in two enemy machines being shot down. On the return journey two of our machines were forced to alight close to the Dutch coast owing to engine trouble. They have been interned."

A dispatch from Madrid dated June 6th, says:

"A British aeroplane fell at Rio Muni, Africa, recently, and the pilot and observer, who were not injured will be interned at Cordova, Spain."

Rio Muni, or Spanish Guinea, is a Spanish possession on the western coast of Africa south and southwest of Kamerun, which formerly was a German possession.

The British official summary of aviation activities for the month of May gives a total of 518 planes brought down; 398 German machines brought down by British airmen, 20 brought down by anti-aircraft gunfire, 100 enemy machines driven down out of control, making a total of 518 aeroplanes destroyed or damaged. In addition, seven observation balloons were destroyed.

ITALY

A British-Italian official statement issued June 4th, says:

"Since May 25th, the Royal Air Force has destroyed fourteen enemy aeroplanes and driven one down out of control. One British machine failed to return."

The War Office communication issued June 5th, says:

"A captive balloon was brought down on the bank of the Piave River.

"Monday evening four enemy aeroplanes were downed."

The Italian War Office issued the following official statement regarding the air fighting of June 8th and 9th:

"Our airships and aeroplanes bombed railway stations, aviation camps and enemy hutments and attacked troops in movement with machine gun fire. At Nattarello station the explosion of a large ammunition dump was observed.

"Our aviators surprised an aviation camp between the Piave and the Livenza and the railway station at Caldonazzo while in full activity and effectively bombed them. Ten hostile machines were downed."

MODEL NEWS

Edited by John F. McMahon

Scale Model of Nieuport Made of Wood

THE model of "Spad" shown in a recent issue has been received by model builders with such favor, that I have decided to publish the Nieuport shown in the cut below. The "Spad," while being a well built model, did not show its characteristics as well as this one, because of the enclosed motor of the Spad.

The Nieuport machine is a well known scrapper, and, of course, a model of the large machine will attract considerable attention.

The construction of this model is much the same as the "Spad" shown previously, the wings and body are of wood and the wheels are aluminum disc with rubber tires; they are 2 inches in diameter, the landing chassis struts of this model, and the "V" strut at the rear of the top plane over the fuselage are made of ⅛ inch brass tubing.

The ailerons are imitation only, a slot being cut in the top wing on each end to represent the opening between wing proper and aileron.

The "V" interplane struts are made of wood fitted together at the apex and wrapped with thread and glue. They are then inserted into place and glued to the wings.

A small model of a Lewis machine gun made to 1/24 actual size is mounted on the top of the plane. The gun is built of brass tubing, the magazine being turned out on a lathe and notched to represent cartridge spaces.

The engine is an exact duplicate of a Gnome 7-cylinder and is the main part of the model. The crankcase is made of a ¾ inch piece of dowel ½ inch long. The cylinders are made of ¼ inch dowel with rings of cardboard glued on to represent cooling flanges. On the top of cylinders to represent a cylinder head, the male end of a snap hook such as women use for waists is used, to which is soldered a pin bent to represent a push rod and a valve rocker, a piece of tubing 1/6 inch is then put through the crankcase and this supports the engine and allows it to revolve, at the same time acting as a propeller shaft.

The engine is then given two coats of aluminum paint and when dry varnished.

The engine cowl is made from the bottom of a tin cup; this is also painted aluminum.

The model is painted with a combination of blue and grey paint to give a sky blue tint. The French insignia, blue, white and red circles are painted on the planes and blue, white and red stripes are painted on the rudder.

The Caproni, De Haviland, Burgess Seaplane Scout, Handley Page models will appear later. All of which were made of wood and were on exhibition recently at Meyrowitz stores on Fifth Ave., New York City.

All of the models, I have just mentioned were built from photographs and drawings appearing in AERIAL AGE.

The reader will notice a dummy aviator in the pilot's seat. This was made from modeling wax such as is used by sculptors and the like.

Model Aeroplane Building as a Step to Aeronautical Engineering

AFTER attaching our propeller in place, we are ready to study the machine by flying it.

To fly, it is necessary to twist the propeller in the reverse way until rubber is sufficiently tightened and then release allowing propeller to spin and dig its way forward.

To get the best results out of the model, it is necessary to balance properly. This being done exactly as we did to balance the glider.

When starting the model on its flight, hold the propeller from turning with the left hand and the body or frame of the model with the right hand. Just a second before throwing model gently on its way allow propeller to spin and gain its required speed. The same instructions for flying the glider apply to this model.

We will now go to the racing model. This is a light affair and is the real flying stick type of model but it has its advantages in teaching aviation to the beginner because it allows a good study of aeroplane flight because of the long flight that may be accomplished with a model of this kind. While a model of this type is built as light as possible to allow for the maximum flight, it must be built strong enough to withstand hard usage and the strain of two rubber motors.

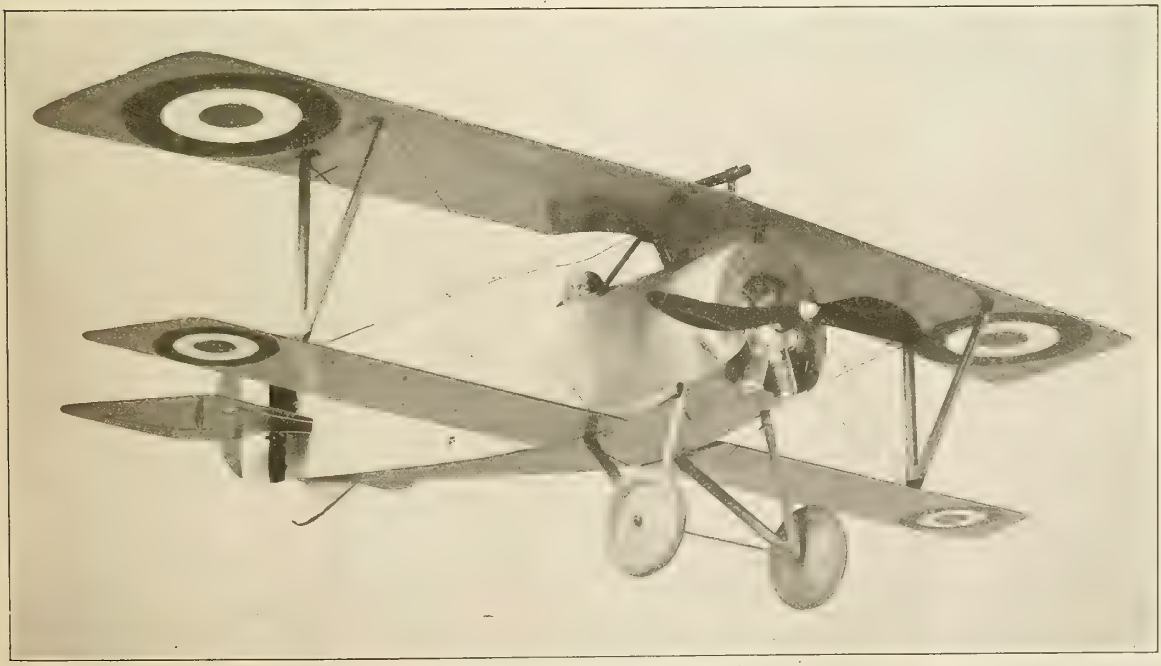
The scale flying stick model has no resemblance to a big machine and should a large machine be built to the same scale as a model of this kind, it would fall apart in the air because it would not be strong enough to support its own weight.

A word of praise must be made for this type of model inasmuch as it takes all the ingenuity the model builder can master to beat some record another has made, and it is the real foundation of the study of aeroplane flight.

Scale flying models have some advantages over the Flying Stick type of model because they actually resemble the large machine and when flying behave like their big prototypes, but the flight of a scale model does not last as long as the Flying Stick type and for that reason, for the time being, we will treat on the light racing type model to become better acquainted with power driven machines.

The racing model aeroplanes are mostly Pusher Type, that is the propeller instead of being located in the front or nose of the machine, are at the rear, one propeller turning the reverse way to the other and each driven by separate rubber motors.

(To be continued)



Scale model of a Nieuport made of wood

Aeronitis

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Ole Travis Mam'y Has First View of an Aeroplane

IT was a "befo' de wah" negress standing on an Austin street corner yesterday morning, waiting for a street car. She toted one of those old-fashioned black shiny valises, a relic of celluloid collar days, and her some 200 or more pounds of weight was topped by a tiny black hat crowned by some frost-bitten looking objects that might have passed for plumes during Harrison's administration.

Puzzled by Aeroplane

One didn't have to use field glasses to see she was from the country. She simply radiated good humor. Or at least she did until she heard the whir of an aeroplane perhaps a thousand feet above.

Then she registered, as the movie director might say, "uneasiness." She quickly glanced from right to left, then front to rear. In either direction she saw nothing to fear.

The whir grew louder and harsher. Suddenly she saw the plane, a gigantic bird sailing far overhead.

Thought It a Bird

"Mister, what sort uv a bird is dat dere," she tremulously asked a passerby.

"That isn't a bird, aunty; that's an aeroplane. It's an automobile of the air. And the man in it is a soldier."

Turkey Buzzard Man

"Aryplan'! What's dat? How come man up dar flyin' 'bout like a turkey buzzard? Tell me dat. Dat's some sort uv a big hawk. Lemme 'lone, mister. I'se goin' 'way from dis here place."

"Look at it now, aunty. See, it's making a turn and is coming lower. Don't you see the man waving his hand?"

She Couldn't See a Man

"Naw, sir, I doan see nothin' 'cept dat it ain't no folks up dere. Lemme 'lone, I tell you I'm goin'."

By that time a coterie of onlookers had assembled, some trying to explain the aeroplane was no bird.

But she steadfastly refused to be convinced.

Insisted It a Bird

"'Tain't no man up dere. Dat's some sort uv a bird," she muttered to every explanation.

"Up dere" the birdman swerved and curved, passing and repassing overhead.

"Let me explain it to you, aunty," said a listening aviator, who wore the bars of a lieutenant.

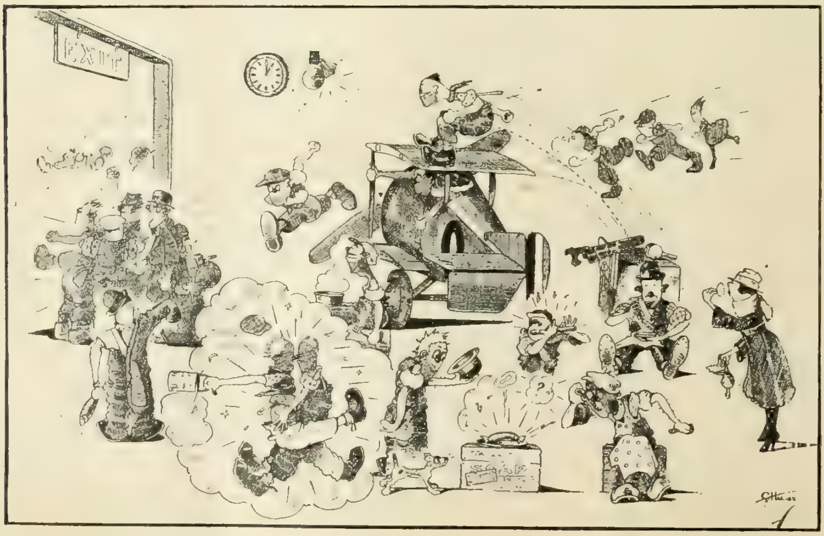
"Well, what you know 'bout it?" she asked him, with something between fear and defiance.

"That is a man up there, and he is riding in an aeroplane, a thing made with an engine that will fly in the air, just like a street car runs on a track or an automobile on the street.

No War for Her

"We are at war now. Those things flying up there are made to fight the enemy with. And——"

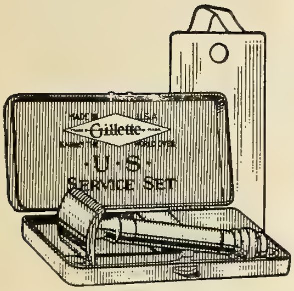
"How cum we at wah now? Didn't we whup the Yankees more'n fifty years er-go? You'all kain't pester me. Dat ain't no man, dat's a bird," said the old woman, as she stalked ponderously down the street, leaving a very much crestfallen lieutenant of Uncle Sam's army, who heard his attempted explanation of "why's an aeroplane."



An Aircraft Factory at lunch time. The efficiency and scientific "motion saving" methods are applied in this period, just as they are when the mechanics are at work. Note the two workmen attempting to occupy the same extent of space at the same time, without any regard for the well known law of physics.

Courtesy "The Aeroplane"

Gillette SAFETY RAZOR



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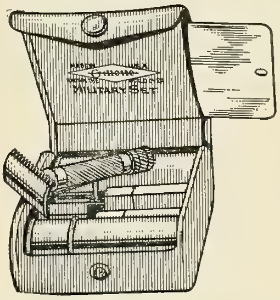

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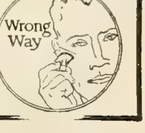

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With a foreword by Alan R. Hawley, President Aero Club of America

By **HENRY WOODHOUSE**

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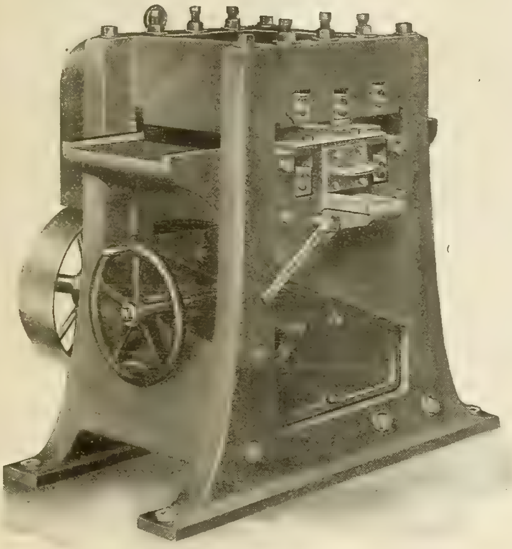

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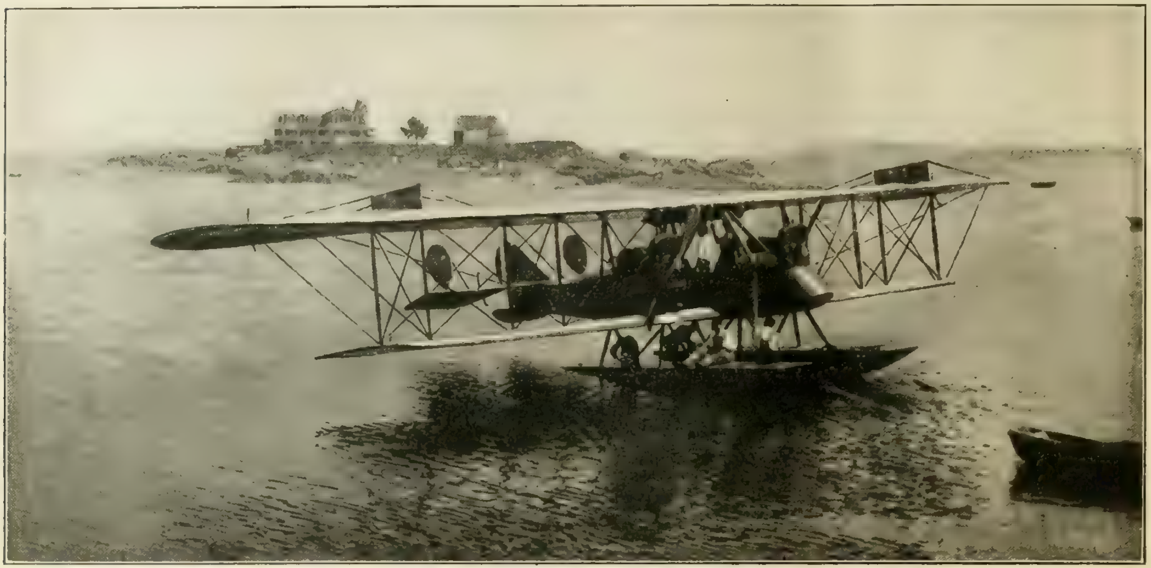
Ridgely, Joseph G., Jr.	SMM
Ricciardi, Attilio	SLR
Rolleston, Moreton, Mountford	SLR; FRF; DIK
Rourke, Frederick William	SLR; GLC
Randell, Hugh Parker	SLR; LDT
Rauh, Joseph Anton	SLR
Ready, James Baird	SLR; DIK
Reilly, Walter Sheridan	SLR
Rohrbach, Charles Henry	SLR
Rowe, Hiram Hatch	SLR
Russell, Franklin Brundage	SLR
Reeve, Orson L.	LHV
Ross, Lucius G.	LHV
Rountree, Andrew J.	LHV
Reisz, George S.	FRF
Rivers, Harold R.	FRF
Reap, Michael B.	RTR
Ream, George D.	TFT
Root, Homer B.	DIK
Ranson, John W.	EOT
Riddlesbarger, Rufus	LHV
Roy, Donald M.	TFT
Ryan, Austin T.	FRF

S

Swan, Robert Edward L.	SLR; VBW
Schaefer, Edgar F.	FRF
Sperry, John A.	FRF
Sanford, Edward W.	SLR; FRF
Saltzman, Charles McK.	Note 10
Shurmur, Clement E.	FRF
Sharer, Donald D.	FRF
Sibley, Eugene	SRC
Sampter, Herbert Charles	SLR; PMT
Sockman, Roy W.	SLR; FRF
Sherman, John K.	AGC
Small, John H., Jr.	DIK
Sands, Herbert Fred	SLR; VBW
Slater, Gordon B.	RTR
Sheehy, Timothy J.	RTR
Steamper, Frank J.	RTR
Silberberg, Mendel B.	SLR; KST
Stoll, Hugo L.	RTR
Swanson, W. A.	RTR
Search, Hendrick M.	SMM
Shaw, James Maddock	SLR; GLC
Stanek, Thomas	SMM
Slade, William	FRF
Sweeney, Edward M.	DIK
Sanderson, Wilford Edwin	SLR; VBW
Slater, Francis C.	TFT
Southard, Alfred M.	TFT
Stackpole, Frank C.	FRF
Seymour, Henry Paul	SLR; VBW
Shrader, Harlan L.	FRF
Slaven, Thomas W.	FRF
Squier, Carl B.	FRF
Schary, Henry Alexander	SLR; EOT
Skeels, Russel H.	DIS
Shepherd, Robert A.	KST
Stratton, William W.	RTR
Sands, Frank Thomas	SLR; AAD
Spivey, Lloyd G.	FRF
Sevey, William B.	DIK
Snyder, Alva W.	FRF
Scheetz, Jack Freed	SLR; RWT
Sauls, Jesse W.	FRF
Shaver, Francis J.	RTR
Shelton, Dupree M.	RTR
Sellers, Lamar	SLR; PMT
Stanton, Frank M.	RTR
Severson, Thor J.	DIK
Slater, Harry E.	FRF
Shillington, Waldo Everett	SLR; KST
Stevenson, Richard W.	EOT
Shedden, George A.	TFT
Selleck, Lawrence M.	SMM
Sexton, Charles Stuart	SLR; EOT
Smith, James Eaton	SLR; TFT (1)
Smith, George V.	DMA
Smith, Frank B.	FRF
Smith, Charles F.	FRF
Smith, Lawrence Otis	SLR; VBW
Smith, Stanley	FRF
Smith, Bernard Rolfe	SLR; CAF
Smith, Henry MacV.	REL; MAC; Note 3
Smith, George M.	DIK
Smith, Leonard L.	FRF
Smith, Joseph P.	DIK
Smith, Harold D.	LHV
Smythe, Allen M.	LHV
Smith, Bashford	RTR
Shepard, Floyd William	SLR
Snyder, Jonathan Lloyd	SLR; DIK
Snyder, Robert Y.	DIK
Stoffer, Charles Thomas	SLR
Strong, Foster Guy	SLR
Shellstrom, Frank Charles	SLR
Stanford, Frank Curtiss	SLR
Stewart, Malcolm Nebecker	SLR
Schuemacher, Clyde Jacob	SLR
Silberman, Moe William	SLR
Snell, Raymond Charles	SLR
Sultzer, Norman William	SLR
Sundstrom, Olof	SLR
Savage, Clair Rich	SLR
Sandvigen, Gilbert Tobias	SLR
Selberg, Arthur Emanuel	SLR
Selff, Robert Elmer	SLR
Selden, James Kirtland	SLR
Severson, Thor Juroyal	SLR
Spencer, Bonifield M.	DIK
Suver, Elmer William	SLR; EOT
Shrader, Harlan L.	LHV
Smock, Harold E.	LHV
St. Clair, Gordon C.	LHV
Sawyer, Asa George	SLR; RWT
Sanders, Randolph R.	EOT
Slaven, Thomas W.	EOT
Stephenson, Lovick L., Jr.	EOT
Schiffer, Wilson Ermlich	SLR; VBW
Stone, Irving Davis	TFT
Sneed, Albert L.	FRF
Saunder, John M.	DIK
Savage, Clair R.	DIK
Saunders, Irving M.	LHV
Sloan, Harold O.	FRF
Sturcken, Harold E.	FRF
Selberg, Arthur E.	DIK
Schaefer, Albert E.	TFT
Sanderhoff, Raymond F.	TFT

T

Taylor, Marvin Harold	SLR
Thompson, Franklin Stolt	SLR
Tobey, Paul Titus	SLR
Tolles, Raymond Pardee	SLR
Tuttle, Alfred Howell	SLR
Ten Eyck, Charles Andrew	SLR
Trantham, Homer	SLR
Thomas, William George	SLR; DIK
Tipton, Andrew Ralph	SLR; DIK
Tupper, Preston Eddy	SLR
Turner, Wiley Baldwin	SLR
Thomas, Charles Edmond	SLR; DIK
Thompson, Frank Carroll	CPR; Note 2; WCS



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Tinnerholm, Ivar E.	FRF
Tompkins, Frederick	PUP
Torley, Thomas F	RTR
Thomas, Murray W.	FRF
Trude, Frederick J.	RTR
Taylor, George L.	RTR
Tremepe, Clarence S.	RTR
Traer, Glenn W.	LHV
Towle, Howard H.	FRF
Tustin, Robert Thomas, Jr.	SLR; VBW
Taylor, Clinton C.	RTR
Titus, Charles B.	FRF
Tracy, Ray P.	RTR
Thierbach, George C.	DIK
Taylor, Frederick H.	DIK
Thompson, Lorin O.	TFT
Thorne, Harold W.	FRF
Thrall, Loren Renfrew	SLR; EOT
Tucker, Edward, Jr.	PFO
Tynes, William F.	DIK
Torney, Stewart W.	FRF
Thompson, Hearle A.	FRF
Thompson, Walter A.	TFT
U	
Underwood, Claude S.	SMM
Utely, Charles B.	FRF; DIK
Usher, George L.	SMM
V	
Vance, Alfred William	SLR
Vawter, George Williams	SLR; GLC
Vollmer, Edward Couch	SLR; GLC
Vinton, Benjamin	SLR; PMT
Vincent, Jesse G.	FRF
VanKosen, John M.	CUI
Verkrouteren, John H.	DIK
Vernon, Fred	FRF
Volk, Charles Francis	SLR
Veblen, Elling H.	DIK
Vessey, Burton F.	DIK
Valle, Paul	TFT
W	
Wright, Marcus Hanna	SLR; EOT
Wright, James Wroten	SLR
Wright, Wilbur Arthur	SLR
Wilder, Morris B.	GLC
Waters, Edgar F. B.	Note 6
Wood, Warren C.	BST
Wasserboehr, Francis B.	SLR; SMM
Williams, Howard E.	BST
Wimer, William B.	DIK
Wiegand, Edmund A.	Note 7
Watson, Vernon Andrews	SLR; PMT
Wardell, Charles H., Jr.	DIK
Ways, Karl H.	DIK
Walker, Albert Kiddy	SLR; PFO
Wheeler, John R.	RTR
White, Walter A.	RTR
Williams, Chauncey B.	RTR
Wilson, Benjamin W.	RTR
Wiman, Louis E.	RTR
Winter, Chauncey D.	RTR
Wittmen, George E.	RTR
Walker, William S.	PFO
Wood, Frank B.	REV; Note 3; Note 1
Wells, Harold Ralph	SLR; AAD
Wymond, William Ingram	SLR; KST
Walsh, William James	SLR; VBW
Wonsey, Ray Dot	FRF
Wahle, Chester D.	FRF
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Wolcott, Henry N.	DIK
Walker, Franklin Caldwell	SLR; VBW
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Wolaver, Charles N.	FRF
Westcott, Reuel R.	SLR; FRF
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Webster, Stephen T.	TFT
Watson, Vernon A.	FRF
Whiteside, Robert B.	DIK
Warrum, Andrew	TFT
White, Roy W.	TFT
White, William E.	EOT
Weltes, Charles B.	SLR; DIK
Wylie, William B.	PFO
Westerhaus, Luther W.	PFO
Woodward, Raymond Newell	SLR; VBW
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Wiggen, Mehemet	SLR; DIK
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Wilson, James E.	FRF
Winn, Richard L.	FRF
Wolf, Clayton S.	FRF
Waller, Alfred Evans	SLR
Westbrook, Virgil Darst	SLR
Wilkins, Alfred Emerson	SLR
Williamson, James Chapman	SLR
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Wiegman, John Paul	SLR
Wachtell. Philip Arthur	SLR
Webb, Henry Wallace	SLR
White, Harold Alexander	SLR; DIK
Whelihan, John Franklin, Jr.	SLR
White, Oscar	SLR
Willett, Albert Bertram	SLR
Wensley, William R.	LHV
Wells, Roe, E.	TFT
Weightman, John A.	LHV
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White, Chester M.	FRF
Worden, Frank L.	RTR
Willrich, Edgar C.	BST
Y	
Young, Russell Alvin	SLR
Young, Ora Wesley	SLR
Young, "B"	FRF
Yost, Harold S.	RTR
Z	
Zuberbier, Ross John	SLR; GLC; FRF
Zender, Frederick A.	FRF
Zander, William E.	PFO
Zipse, William E.	GLC
Ziegler, John W.	DIK

(Continued from page 675)

weakened raw material to reach the factory, and to some of the more serious defects which even a careful inspector may easily overlook, and to the danger of such material entering into aeroplane construction. The maximum efficiency can be attained only by expert, rigid and unremitting inspection all along the line, but beginning in the woods and at the sawmill.

Office of Investigations in Forest Pathology
Bureau of Plant Industry,
San Francisco, California.

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Dayton. They brought word that the plants visited were rapidly reaching a quantity production basis.

Members of the sub-committee, which is composed of Senators Thomas of Colorado, Reed of Missouri, Smith of Georgia, New of Indiana, and Frelinghuysen of New Jersey, declined to anticipate their report by a detailed account of the trip. They expressed themselves, however, as pleased with the showing now being made, and predicted that from now on there would be a marked improvement in the situation. The production of Liberty motors, they said, is increasing steadily, and will very shortly reach a point where it will meet American demands.

While away the Senators witnessed a number of tests of the Liberty motor. While there are certain questions yet to be worked out in order to improve and perfect it, they say, the tests were very satisfactory.

Because of the Army Appropriation bill now pending before the Military Committee, plans for resuming the inquiry are uncertain. Members of the sub-committee said their work had only started, however, and that before beginning the hearing of testimony in Washington they expected to make other inspection tours.

Aerial Mail Service of the Future

(Editorial in N. Y. *Times*)

THE best authorities upon aeronautics, including inventors, entertain no doubt that the safety of the improved aeroplane will be limited only by the fallibility of pilots and mechanics and by unseen flaws of material used in construction. According to expert judgment, the aeroplane will compete with the automobile as a means of conveyance and communication. The inexorable demands of war have done more for the aeroplane than could have been expected from many years of industrial peace. A swifter, stancher, safer flying machine is a compensation of the war. It has multiplied trained pilots into the scores of thousands.

After the war inventive minds will evolve a motor compared with which our vaunted Liberty will seem like an experiment in the retrospect, and every one of the essential parts of the fabric that carries the motor will be perfected. So say scientists interested in aeronautics. Their confidence is infectious. There is no cause for wonder if the Post Office Department, which has been experimenting with an aerial post between New York and Washington, is now planning an extension of the service to all parts of the United States. This is the program:

> Flights between Chicago and other Middle West cities and Eastern points, and, finally, transcontinental flights.
>
> Washington to Chicago flights in from seven to nine hours.
>
> Establishment of flights in sections not accessible by trains.
>
> Aerial routes where circuitous approaches, due to canons, lakes, and other natural objects, make ordinary mail deliveries unusually slow.
>
> Final interlocking of the entire country after the war with aeroplane mail service for letters and packages.

The longer the route the greater the superiority of an aeroplane mail service over a railway service. The Empire State Express could run from New York to Chicago in eighteen hours; a high-power aeroplane would cut the time in half. A relay of aeroplanes would reduce the schedule between New York and San Francisco to thirty hours. Some day there should be an aerial express for a thousand and one articles, perhaps a service for perishable products. Baggage carried through the air is conceivable.

Of the hosts of war pilots many will be open to engagement when peace returns: to fly for the Government, for corporations and individuals. Now they are defying machine guns, aircraft guns, and diabolical devices of the busy mnuition-makers. In peaceful times these flying men will have to contend only with the elements. How beatific the transformation! Fogs, snowstorms, lightning will become as familiar as friends. "We are training aviators now," says Mr. Praeger, Second Assistant Postmaster General, "with the intention of using them for the aeroplane mail service when they return from aviation in France." It will be exhilarating as well as remunerative work, and it may be supposed that the supply of aeroplane drivers will be greater than the demand eventually.

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Machine for Commercial Purposes, Mail and Express Routes.

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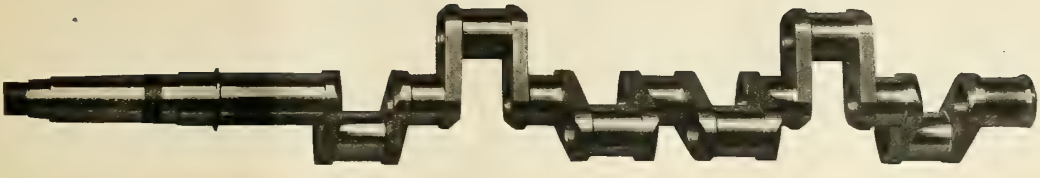

AEROPLANE CRANKSHAFTS

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(*Continued from page 676*)

retors — Ignition systems — Lubrication — Types of aviation engines: Gnome, Hispano-Suiza, Curtiss, Thomas-Morse, Hall-Scott, The Liberty Motor.

VII. Types of Aeroplanes—Wright double pusher biplane—Curtiss pusher—Curtiss tractor — Antoinette monoplane — Bleriot monoplane—Deperdussin monocoque—Hanriot monoplane—Martin tractor biplane—Signal corps tractor—Spad tractor aeroplane—French Nieuport speed scout—Sopwith tractor biplane—U. S. Army Dunne type biplane—German Taube monoplane—German Aviatik tractor biplane—Twin-motored Caudron—Farman biplane—Vickers pusher—Bristol speed scout—Voisin fighting biplane—German Albatross—Marine aeroplanes and flying boats: Wright aeroboat, Curtis flying boat, Leoning monoplane aeroboat.

VIII. Flying—The forces acting on an aeroplane in flight—Stability and airworthiness of aeroplanes—Pitching—Stalling and diving — Rolling and lateral balance — Turning—Skidding and side-slipping—Directional stability—Spirals—The tail-spin — Hydroplaning — Military use of aeroplanes—Scouting and fighting planes—Special requirements for war work—The training of an aviator.

For further information address Prof. Paul Klapper, Director of the Summer Session, at the College.

Men In Uniform Ask for New Fiction

"The soldiers persistently ask for new novels, which never seem to be part of the gift shipments," writes one camp librarian to the Library War Service Headquarters of the American Library Association.

"I find a special need among the patients for up-to-date reading matter," writes the chaplain of a base hospital. And from a hospital librarian comes an appeal for new fiction.

In the three million books given by the American people for camp library use, there are few 1918 novels. It is true that old books, like old friends, are always welcome, but the new ones are wanted too.

With vacation days at hand, many people will be buying recently published novels to read during summer hours on boats, in camp, or at home.

Annual Meeting of Pennsylvania S. A. E.

Philadelphia, Pa.—More than 100 members and guests attended the annual dinner of the S. A. E., Pennsylvania Section, held at Hotel Adelphia, after a visit to the Hog Island shipyards. Among the speakers of the evening were Mr. Harry Tipper, Mr. D. Ludlum, Mr. H. L. Horning and Mr. William B. Stout, technical adviser to the Aircraft Production Board.

Mr. Stout pointed out the great difference between the development of aircraft production and that of production in other lines, such as shipbuilding, due to the fact that there was no accumulated experience in aircraft production in this country when we entered the war. This was largely due to the patent situation, which made entrance into the aircraft industry equivalent to the purchase of a law suit. Apropos of the criticism made on the Liberty aircraft engine some time ago a certain prominent British flyer, in speaking before a society composed of British and Canadians, said that he had driven every aircraft engine that had been used on the front, but he had never been behind an engine that would compare with the Liberty engine.

Mr. Stout said that on account of our tremendous service facilities we would have very little trouble with engines, and that most trouble would be with the so-called connecting details. Aeroplanes are now capable of climbing about as fast as the heart of the aviator will stand. It is America's part in winning the war to make the aeroplane a production job which it is not now.

As regards lubrication of aircraft engines, good service is given by both mineral oil and castor oil. The Liberty engine does not require castor oil. Mr. Stout also spoke of the German giant aeroplanes with five engines, which took part in recent raids on London, and which carry 3,000 pounds of bombs, each bomb weighing 600 lbs. It has not yet been learned whether the engines were of the 160 or 260 h.p. type. Two inch and three inch guns are now being used on aeroplanes and machines which are being used by the Germans to co-operate in infantry attacks carry an armor under the fuel tank and the cock pit. Recently many of the German Albatross planes have collapsed in the air, which is due chiefly to the fact that this plane was originally designed for a 160 h.p. Mercedes engine, but later, in order to increase its speed and climbing power, a 260 h.p. engine was substituted.

One Cent a Mile Fare for Soldiers

Washington, D.C.—A special rate of approximately one cent a mile on the railway systems controlled by the Government is to be allowed the men of the Army and Navy who intend visiting their homes before going overseas, according to the following announcement issued by the U. S. Railroad Commission on May 24th: "Director General McAdoo, realizing that the payment of the full railroad fare means a serious hardship to our soldiers and sailors who desire to visit their homes before going overseas, has ordered that as soon as necessary details can be completed soldiers and sailors of the United States forces, when furloughed and traveling at their own expense, will be granted a rate of approximately one cent per mile. This fare will be available on delivery to ticket agents of certificates signed by commanding officers. Such certificates of standard form will be prepared and distributed with the utmost promptness." The order will extend the special privilege to the men in training at all camps and training stations under the jurisdiction of the War and Navy Departments.

Governor Cox Predicts Aerial Offensive

New York City.—Governor James M. Cox, of Ohio, in an interview in New York intimated that he fully expected to see the Germans driven out of the air and thus enable the infantry to undertake a sweeping offensive. "And we need not be surprised to see the German navy destroyed by aeroplanes," he added.

One-Thousandth Liberty Motor Shipped by Detroit Manufacturer

Detroit, May 29th.—The one thousandth Liberty aeroplane engine produced by a local motor company was shipped from the factory on May 29th, just a year from the day the first blueprints were sent to Washington.

The Packard Company, first to get into production, is turning out twenty-five motors a day. The Lincoln Motor Company is completing ten a day, with a much larger output immediately in sight. The Ford Motor Company, which has made thousands of the cylinders for both Packard and Lincoln, is on the eve of producing motors in quantity. The Marmon Company also is about to enter production.

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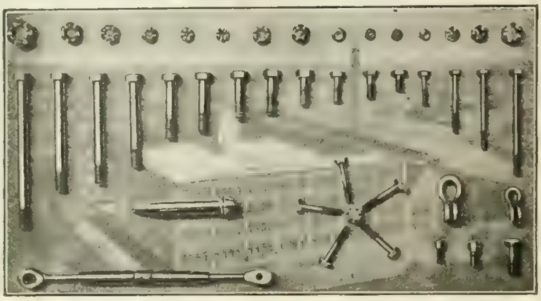

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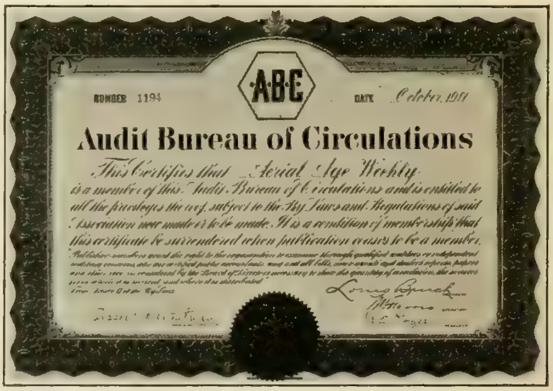

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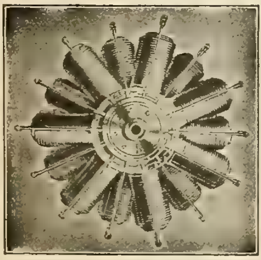

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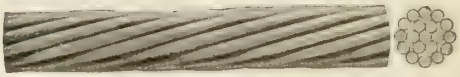

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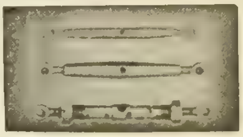

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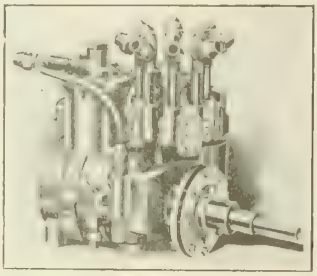

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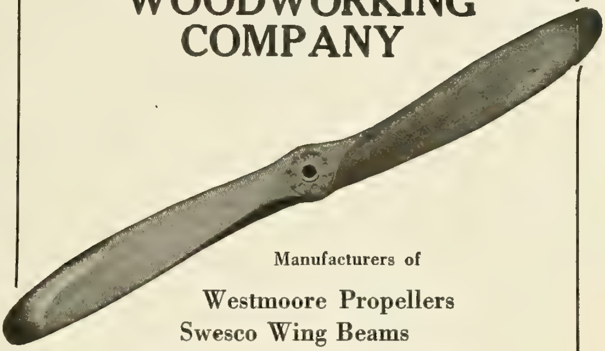

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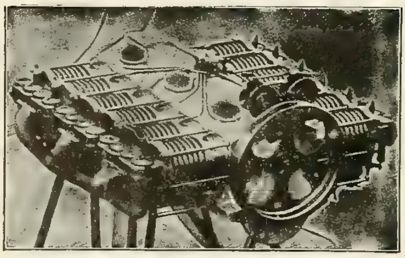

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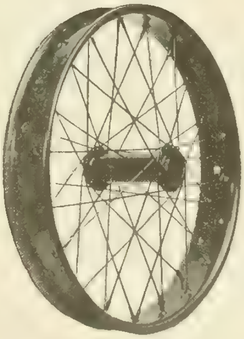

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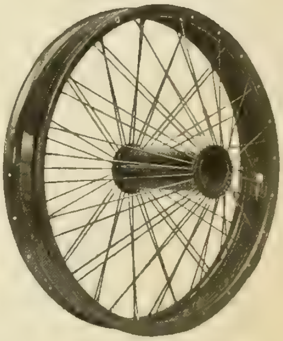

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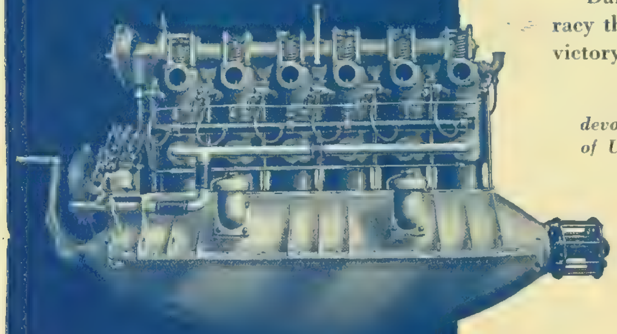

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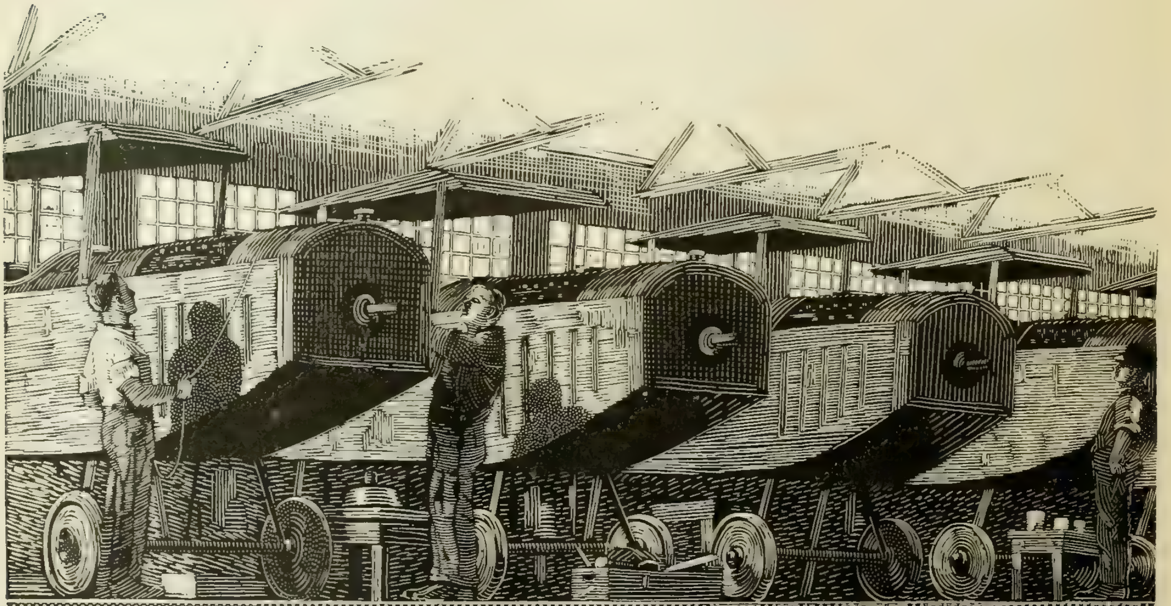

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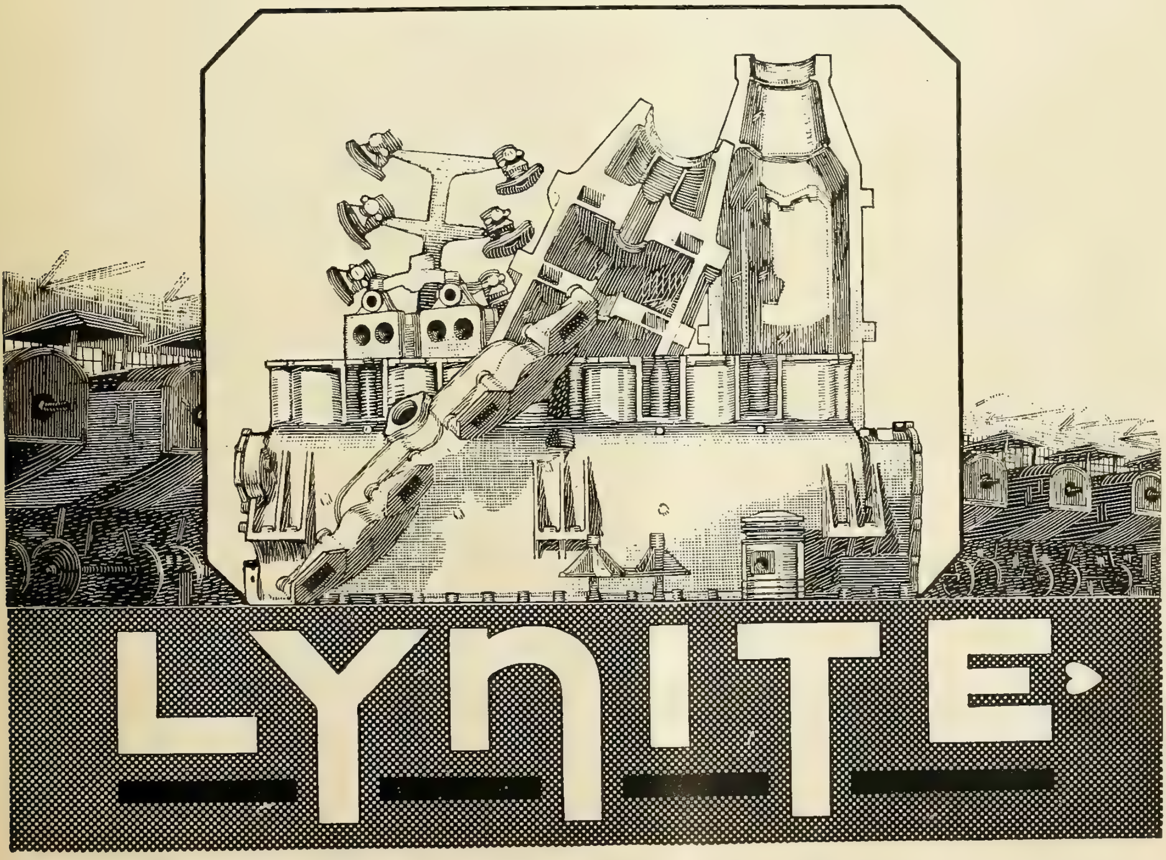

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> **"Boiling tests and salt water soaking tests as follows were made on each specimen: Specimens were boiled for 8 hours, then baked for 24 hours at 100 deg. C.; specimens were soaked in salt water (4% salt by weight) at room temperature for 24 hours and then baked for 24 hours at 100 deg. C.**
>
> **"Results:—The glue held firmly in all tests. Neither the boiling nor the salt water soaking tests caused any indications of separations of the plies of the veneers tested."**
>
> **Dated, March 30th, 1918.**

Laminated wing beams of spruce. We have under contract a supply of aeroplane spruce and could undertake to manufacture 50 sets of 8 wing-beams daily. In an official Government report on a sample wing-beam section submitted by us for test, it was stated —

> **"Conclusion:—These beams carried a much greater transverse load than solid wood beams of the same material and section. The glue joints between web and flanges are stronger in shear than the web section, and the glue had fairly good waterproof qualities. These beams show the superiority of the laminated construction over the solid construction as to strength and great saving in material."**
>
> **Dated, March 11th, 1918.**

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AEROPLANES

TEXTBOOK OF

MILITARY AERONAUTICS

With a foreword by Alan R. Hawley, President Aero Club of America

By HENRY WOODHOUSE

Author of "Text Book of Naval Aeronautics," etc. Member Board of Governors, Aero Club of America.
Member National Aerial Coast Patrol Commission, etc., etc.

Chapter Headings

The War to be Decided in the Air.
The Warplane for Bombing and Torpedo Attacks.
Dropping Bombs from Aeroplanes.
Battleplanes and Aircraft Guns—The Dominant Factors in Maintaining the Supremacy of the Air.
The Fundamental Principles of Aerial Combat.
Directing Artillery Fire by Night and Day Signaling to and from Aircraft.
Kite Balloons the Eyes of the Artillery.
Aero Photography.
Reconnaissance and Contact Patrol Work by Aeroplane.
Night Flying.
Radio for Aeroplanes.
Military Aerostatics.
Hydrogen for Military Purposes.
Training Aviators for the United States Army; Home and Foreign Service.
Regulations for Uniforms of U. S. Aeronautic Personnel.
Aeronautic Maps.
History of United States Army Aeronautics.
The Evolution of Military Aviation.
Some Problems in Aeroplane Construction.
Methods of Measuring Aircraft Performances.
The Sperry Automatic Pilot.
The Case for the Large Aeroplane
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Executive military officers who want to know the exact status of military aeronautics and the principles of aerial strategy; students learning various phases of aerial warfare; Aeronautic engineers and manufacturers who want to know the duties of aircraft, in order to design and make more efficient machines; and the average patriot who wants to learn about aeronautics in the hope of finding an opening to employ his or her efforts to help the Government in carrying the war to a successful conclusion, will find the Textbook of Military Aeronautics the publication they have been looking for.

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VOL. VII — NEW YORK, JUNE 24, 1918. — No. 15

AERO CLUB SUPPORTING SECRETARY DANIELS AND ADMIRAL BENSON AND ADMIRAL PALMER IN FIGHT FOR EXTENSION OF NAVY PERSONNEL

SUPPORTING Secretary Daniels, Admiral Palmer and Admiral Benson in their demands for an increase of the personnel necessary to properly man the fleets, Mr. Alan R. Hawley, President of the Aero Club of America, and for 4,000 additional men for naval aviation, has written to Congressman Lemuel P. Padgett, Chairman of the Committee on Naval Affairs of the House of Representatives, pointing out that Mr. Padgett is responsible for the lack of aerial coast patrol organization necessary to defeat the U-boats.

Mr. Hawley's letter to Mr. Padgett is as follows:

"My dear Mr. Padgett:

"Like many other Americans, I have read with a feeling of indignation of your persistent efforts to prevent the expansion of the personnel of the Navy, as shown by the letters of Secretary Daniels, Admiral Benson and Admiral Palmer to you, urging the increase of the personnel to the point necessary to properly man our fleets.

"You are assuming now, while the country is facing the greatest of dangers, the same attitude which you assumed in 1916 towards the bill to provide for the establishment of an aerial coast patrol. Because of your opposition, the country was deprived of an efficient aerial coast patrol, which could in the intervening two years have been developed to such a point of efficiency that no U-boats could operate with impunity in American waters.

"We submit that the fact that U-boats have been operating in American waters and have destroyed over 40,000 tons of shipping without being themselves destroyed is incontrovertible evidence that your obstructive attitude at the time has cost the country an enormous price.

"Because of your opposition to the Johnson-Kahn Bill, which would have provided $1,500,000 for the organization of the Aerial Coast Patrol in 1916, and would have given two years' time in which to organize an efficient aerial coast patrol, now that the U-boats are operating in American waters, we find ourselves inadequately equipped to meet the U-boats, and find by using all the Army aviators and land aeroplanes available we have been unable to prevent the U-boats from sinking our ships and destroying American lives and property.

"Had you not obstructed this plan, the head-lines in the papers at the time when the first U-boats began to operate off the American coasts, would, no doubt, have read:

"'U-BOATS BLOWN UP BY OUR AERIAL COAST PATROL.'

"We would have had such head-lines if we had been ready to meet the situation; but, admitting that the U-boats had come entirely unexpected and had sunk a few ships, the head-lines within a few days would have read:

"'U-BOATS SANK THREE SHIPS. HAVE BEEN DESTROYED BY OUR AERIAL COAST PATROL.'

"At the time when we pleaded for the adoption of the Johnson-Kahn bill, there were about 50 patriotic young Americans learning to operate seaplanes at their own expense, so as to be ready to meet an emergency. About 2,000 more were ready to take up training, provided they could take this training under the supervision of a naval officer, but the Navy did not have the officers to assign to supervise this training, and, as you refused to bring up the Johnson-Kahn Bill for the consideration of your Committee, you prevented the full development of a reserve aerial coast patrol.

"Fortunately, over 100 patriotic young men continued their aviation training at private expense, and they were subsequently taken over by the Navy, and are now in the Executive and flying branches of the Naval Air Service.

"If this much was accomplished notwithstanding your opposition and disapproval, how much could have been accomplished had you taken a broader attitude towards the matter? We undoubtedly would have had several thousand fully trained reserve aviators and aerial coast patrol stations at every 20 miles along our Atlantic coast.

"We cannot plead ignorance of what was necessary, because reports were available at the time of what French and British naval authorities had found it necessary to do to protect their shipping from U-boat attacks. We had, in fact, a fearful example of what would happen if we did not prepare immediately, because these British and French authorities were trying to get sufficient aeroplanes and aviators to establish aerial coast patrol stations at every twenty miles along their coast to be able to meet the U-boat menace fully. And a few months later the French Minister of the Marine, in his report to the French Chamber of Deputies, which was published broadcast, said:

> "'We have found it necessary to organize seaplane stations all around the coasts, so that the zone of action of each station joins that of its neighbor on the other side.'

"We submit that the results show that in taking the position you took in preventing the organization of the aerial coast patrol in 1916, you assumed more responsibility than any man was justified in assuming in the face of such a crisis as this country was facing. We again feel so in regard to your efforts to prevent the increase of the personnel necessary to properly man the fleets, and we submit that you owe a public explanation to the country of the reasons, if you have any, for your obstructing policy—a policy which has already been so costly to the country.

"Admiral Palmer, in his letter to Secretary Daniels of June 12, made public yesterday, states:

> "'On paper the fleet and shore organizations of the Navy appear to be ready for any emergency, but, actually, they are not, simply because they are lacking in proper officers at the head of the various sub-divisions. Until we get officers in sufficient numbers in the higher grades, the organization cannot be ready to meet the emergency. To fail to recognize this situation is to court national disaster.'

"Your opposition to the aerial coast patrol in 1916 has resulted in the U-boats giving us an idea of what Admiral Palmer means, and, therefore, steps should be taken immediately not only to grant the absolute minimum number of officers which the Navy may get along with, but to grant the maximum required, so that such important branches of the Navy as the aerial coast patrol, training of aviators and production of seaplanes may be put under the direction of Rear-Admirals.

"Very sincerely yours,
"(Signed) ALAN R. HAWLEY,
President, Aero Club of America."

BRITISH PARLIAMENT URGES NEED OF THOUSANDS OF AEROPLANES TO WIN THE WAR IN AIR

THE British Parliamentary Air Committee at a meeting on June 18, demanded that the Government take action to stimulate the production of aircraft.

Another demand was for reprisals for the recent German bombing of the Red Cross hospitals in France. The destruction of one of the Rhine towns was demanded in reprisal for the action of the Germans.

Joynson Hicks, who is a member of Parliament and chairman of the committee, in an interview with the New York Sun said:

Huge Programme Demanded

"We intend to demand a huge air fighting programme for the spring of 1919 and also to impress the Government with the fact that the war will be won in the air. To do so the Allies must have hundreds of thousands of aeroplanes. We understand that the Liberty engine is not ready for air purposes yet and wish to impress upon the Government the vital necessity of keeping up an abundant supply of high power engines.

"We will propose the following resolutions:

1. This committee desires to reiterate its grave anxiety in regard to the supply of sufficient high powered machines for the next year's campaign and that unless the Secretary of State for Air and the Minister of Munitions are prepared at the end of this meeting of the committee to make a statement as promised in the House of Commons, they must press for debate on the subject.

2. They desire to reiterate their grave anxiety at the heavy loss of life in training pilots in this country and will be glad to know whether the Secretary of State for Air will confer with them upon the problem.

Investigation Is Asked

3. They feel that the question of the Lochdoon airdrome (in Scotland) cannot be allowed to remain in its present inconclusive position and that for the honor of the air service further investigations must take place and the responsibility fixed upon whomsoever was guilty of such unwarrantable waste of public money. The Lochdoon airdrome has been constructed at an expense of millions, but never has been used.

4. They view with horror the action of the Germans in attacking with bombs and machine gun fire British hospitals in northern France and trust the Government will take resolute and definite steps, possibly by the way of destruction of one of the Rhine towns, to convince the enemy that actions of this kind cannot longer be tolerated.

5. They consider the position of the Secretary of State for Air, without a seat in either house of Parliament, is highly unconstitutional and request that the Government provide the date for the discussion of a resolution on the subject.

SEND ONE LETTER A DAY BY AEROPOST AND CONTRIBUTE DIRECTLY TO TRAINING MILITARY AVIATORS

BY sending one letter a day by aeropost you can contribute directly to increasing the opportunities to train military aviators in flying across country and by dead reckoning, which is the training required to hunt U-boats and to bomb cities behind the German lines.

If a hundred thousand people in the forty-eight States should decide to send a letter a day by aero mail the result would permit extending the aero post service each, west and south and provide continuous training for a minimum of 300 aviators in flying across country and navigating by dead reckoning.

Few people seem to realize that letters can be sent to any city south of Washington by aeropost from New York, making much quicker connection with the regular postal routes and arriving at their destination many hours before mail sent all the way by rail. The same is true of letters sent via Philadelphia to points in the West and also from Washington to New York to points in New England.

Aeroplane mail received at the following postal stations in New York City up to ten minutes before the hours of leaving named below will be delivered in Philadelphia and Washington on the same day as indicated.

	A. M		A. M		A. M		A. M
G. P. O.	10.50	K	10.25	U	10.20	Hud. Term	10.45
A	10.35	L	10.20	V	10.30	M. Sq.	10.30
B	9.47	M	9.52	W	10.25	Penn Ter.	11.15
C	10.35	N	10.30	X	8.49	Times	10.40
D	10.20	O	10.35	Y	10.30	Tomp	9.40
F	10.30	P	10.20	College	10.05	Tremont	8.06
G	10.35	R	8.43	Fox	8.26	Wall	10.20
H	10.25	S	9.53	G. Cent.	10.55	Wash.	9.46
I	10.20	T	8.35	H. G.	10.00	W. F.	8.15
J	10.20						

If you receive business letters from Washington or Philadelphia in the morning, at the beginning of a business day, you can answer them immediately and by mailing the letter at any of the stations given in the accompanying table before the time of closing the mail at that station, your letter will be delivered in Washington or Philadelphia in time to allow business men or government officials to answer you the same afternoon and you will receive the answer the following morning.

The aeropost will do away with sending special couriers to deliver important mail or legal papers, plans, specifications, etc. The postal authorities can arrange to make delivery of the mail immediately upon its arrival at Belmont Park to the firm's representatives, if they so desire.

By adding an aerial mail route from Washington to Chicago, by way of Wheeling, W. Va., and Lima, Ohio, one day can be saved in the delivery of mail in the Middle West, and a similar saving can be effected in the reverse direction. Letters mailed in the West and South, bearing an aeroplane stamp will reach their destination almost two days ahead of the regular mail matter. The time of mail delivery will be cut down further by the establishing of routes from New York to Boston, and from Philadelphia to Pittsburg, Cleveland and Detroit, connecting the industrial centres of the country.

These routes will be added as soon as the number of aeropost letters is large enough to justify the step. You can make it large by sending one letter a day by aeropost.

The cost for this service by aeroplane at present is only eleven cents (11c) an ounce. Ten cents (10c) is added for special delivery service, and three cents (3c) regular postage, making twenty-four (24c) an ounce in all, and with a greater volume of mail it is possible that this rate may be reduced.

The performance of the aero mail carriers between New York and Washington has been such as to warrant the hearty co-operation of all business men and firms, and especially those interested in aviation.

THE AIRCRAFT INVESTIGATIONS

IT was disclosed June 13 that Charles Evans Hughes has extended the investigation of the work of the Aircraft Production Board. His findings will not only include a report on the charges that irregularities were permitted in the outlay of funds, but will also give to the nation a comprehensive statement of the reasons for the Board's failure to create a large number of planes for use abroad. It is understood that the extension of the scope of the investigation is undertaken with approval of President Wilson.

The examination of the witnesses is conducted behind closed doors at offices in the Department of Justice Building.

(*Continued on page* 741)

THE NEWS OF THE WEEK

W. C. Potter on Aircraft Board

Washington, June 17—William C. Potter of New York was nominated by President Wilson to be a member of the Aircraft Board.

William Chapman Potter is essentially a production man. He started life as a mining engineer, and after many years in that work both in Mexico and this country he became identified with the production of automobiles, vice-president of the Guaranty Trust Company and president of the Intercontinental Rubber Company.

Mr. Potter is in his forty-fifth year. He was born in Chicago, and after studying at the Chicago Manual Training School was graduated from the Massachusetts Institute of Technology in 1897. For a time he prospected on his own account in the Rocky Mountains and then, as a mining engineer, entered the employ of several mining companies.

In 1901 he became mining engineer for the Atchison, Topeka and Santa Fe Railroad, resigning two years later to enter an engineering firm. In 1904 he was engaged by the Guggenheim Exploration Company and became resident manager of the Guggenheim interests in Mexico. He gave up that position the following year to accept the post of general manager of the interests of the American Smelting and Refining Company and the American Smelters' Securities Company, both in this country and Mexico. Mr. Potter served both as a director and member of the executive committees of those companies. He became president of the Intercontinental Rubber Company in December, 1911.

In addition to his post as vice-president of the Guaranty Trust Company, Mr. Potter recently has been a director of the Allis-Chalmers Company, the Maxwell Motor Company, and the Richmond Radiator Company. He is a Republican, but never has taken an active part in politics. He is a member of the Metropolitan and the New York Athletic clubs. His home is at 177 East Seventy-first street.

Capt. A. C. Weidenbach, the head of the aero mail fliers

Our Air Schools Abroad Colossal

The New York *Times* special correspondent, in conclusion of the first authorized description of the work accomplished by the American forces since they landed in France, writes of visits he paid to several of the new American flying schools. He says:

"I am convinced that these American boys will rank among the best fliers in combat work at the front. On a recent Sunday morning at one of the flying centres I visited there were perhaps sixty machines in the air at once, some practicing in formations, some doing ordinary stunts, some advanced acrobatics, and others hard at combat work.

"At another point some distance away I was equally impressed with both the work in progress and the working plans of one of the extensive so-called 'air service production departments.' This important centre of activity, which is typical of several now in course of construction, covers a tract of land over six miles long by a mile and a half wide, where the construction, assembling, testing, and repair of American aeroplanes will soon be going ahead full tilt on a scale never before known. The work splits into four main divisions—transportation, production, construction, and supply."

Pays $1,000 for Envelope Addressed By President

Noah W. Taussig, a philatelist for more than fifty years, on June 11th, paid $1,000 for an envelope bearing President Wilson's autograph and one of the new twenty-four cent aerial mail stamps, which was sent on the first airpost trip from Washington to New York.

The envelope was auctioned off at the Collectors' Club for the benefit of the American Red Cross.

Gives Sea Girt for Aviation

Governor Walter E. Edge, of New Jersey, in a telegram to the chief of the aviation section of the War Department at Washington, June 11th, tendered the Federal Government the use of the State Encampment at Sea Girt as a permanent or auxiliary aviation station.

British Here On Special Mission

Washington.—Lieut. Col. John Cyril Porte of the British Royal Air Force, with Major Parsons of the same arm, arrived in Washington on June 11th, associated with a special mission connected with our aerial programme.

Porte was recently decorated by King George, who made him a commander of the Order of St. Michael and St. George for distinguished services during the war.

Lieut. Col Porte was the aviator who had planned to fly across the Atlantic. His plane was being built for him in this country by Rodman Wanamaker and he was just about ready to start when the war broke out. He returned to England and resumed his duties in the navy.

Supervisor of Aero Mail

Capt. Adolph C. Weidenbath, of the Signal Corps, who has seen three months' service as a flier with the American Expeditionary Forces, has been appointed as a supervisor of the aeroplane mail service between Washington and New York, succeeding Major Reuben H. Fleet, S. R. C., who has been transferred to a flying school in California. Captain Weidenbath's appointment is pending the development of the service at a point where it can be turned over to a successor.

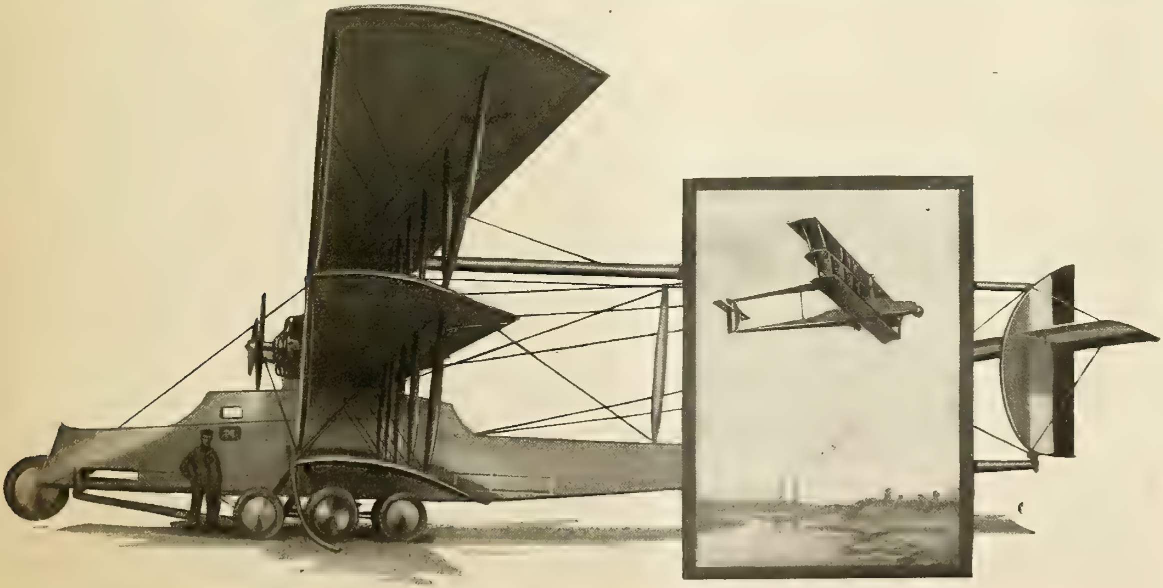
May Shift Aerial Landing

Washington.—The aerial landing at Belmont Park, Long Island, N. Y., now used by the aeroplane mail service, may be shifted to Branch Brook, near Newark, N. J. This site is now being inspected because its location offers better facilities for transferring the mail to the New York post office.

To Investigate Aeroplane Accidents

Washington.—There will be an investigation by a special committee of Congressmen into the causes of accidents in the American aviation training schools, according to a resolution introduced in the House of Representatives June 5th. The resolution says: "It is reported that some at least of the accidents at the American aviation fields were due to the defective construction of the aeroplanes and in no wise to the fault of negligence of the aviator." The sum of $5,000 is authorized to pay the expenses of the investigation. The speaker is to name the committee.

The committee will make recommendations for action for the prevention of such accidents in the future.



The first photograph of the Voisin Triplane published in America. (French Official Photo.)

© Committee on Public Information

A "Penguin" or "Grasscutter", a plane with reduced wing spread which cannot rise more than six feet off the ground. Used for teaching the controls to student aviators

Aero Mail Beats Thunderstorm and Breaks Records

Lieut. Culver broke the Aero Mail service record both for speed and height on June 12th, when, with a Liberty motor driven aeroplane he made the trip from Philadelphia to New York in forty-two minutes, at an approximate average rate of 127 miles an hour, attaining during the flight a height of more than twenty thousand feet. At Trenton, N. J., he overtook a thunderstorm travelling in the same direction, passed through it and beat it to New York by nearly half an hour.

Aviator Jack M'Gee Killed

East Greenwich, R. I.—Jack McGee of Pawtucket, an aviator who had given many exhibition flights in this country, was killed in an aeroplane accident June 11th while flying over Narragansett Bay.

The machine in which McGee was killed sank and efforts to recover the body of the aviator were delayed pending the arrival of a derrick.

Phil Rader in Fatal Accident

San Francisco Aviator Phil Rader, killed in an aeroplane accident June 10th, at Buffalo, N. Y., was well known as a sporting page cartoonist on a San Francisco newspaper

At the outbreak of the war he enlisted in the Foreign Legion and during his term of service continued his work as a cartoonist, syndicating his output to the Chicago *Daily News* and other publications

Later he was assigned to the Royal Flying Corps, and after several months' service in France was sent to the United States to act as instructor.

Major Bishop, V. C., D. S. O., M. C., Leads Flying Circus

Toronto.—After supervising aerial gunnery instruction in England for some time, Major William A. Bishop, V.C., D.S.O., M.C., Canada's noted air fighter, has had his wish granted and has gone to the front in command of a "circus."

Major Bishop was the premier airman of the Royal Air Force when he left France, much against his will, to become Director General of Aerial Gunnery for the Royal Flying Corps. He has up to date a record of forty-seven German aeroplanes which he has destroyed. He was decorated by King George at Buckingham Palace, with the Victoria Cross, the Distinguished Service Order, with a bar, and the Military Cross. This was the first time in history that these four decorations had ever been conferred on any one man at the one time.

Military Aeronautical Instructors Not Available for Line Duty

Washington, D. C.—Officers of the Corps of Instructors, Signal Corps, appointed with a view to their utilization as instructors in schools of military aeronautics and designated as such in the orders directing them to report for duty, are not available for duty as line officers nor for assignment to tactical units. The primary duties of these officers are those pertaining to the instruction of cadets in the schools of military aeronautics. Their services may not be utilized for any other training. These duties will be performed under the supervision of the commanding officer of the School of Military Aeronautics.

Amsterdam-London Air Mail Is Planned

The Hague.—Plans have been made for postal service between Amsterdam and Groningen by aeroplane under the direction of the military air service. The military authorities will also cooperate in establishing an air service between Amsterdam and London. Mails will be sent by the air route twice a day, the time of transit varying from one and a half hours to two hours, according to the weather.

Mail for Aviation Camp

Washington.—Postmasters are requested to instruct patrons to address mail for United States aviation squadrons at Camp Morrison, located in the vicinity of Morrison, Va., as follows:

"The name of the post office, Morrison, Va., should not be included in the address. Mail intended for the military personnel at Camp Morrison should not be included in packages for Morrison, Va., but should be sent direct to Newport News, Va., labeled, "Aviation Branch."

American Airmen in France

According to a press report of June 17th, Sergeant David E. Putnam, of Brookline, Mass., has established a new record by bringing down five German aeroplanes in one day. Three of his victories are official and the other two are being investigated. The other two, if they are officially accredited, will make Sergeant Putnam's total thirteen, the greatest number to the credit of any American flier. At present Lieut. F. E. Bayliss tops the list with twelve.

General Pershing's statement regarding aviation, issued on June 15th, says:

An American air squadron carried out the first all-American bombing raid on June 14th, destroying certain German military establishments near Metz.

Eight aeroplanes dropped ten bombs each on cantonments, supply sheds and railways in the vicinity of Metz, Dommary and Daroncourt.

A second excursion of American bombing planes was made late that afternoon behind the German lines. Five American machines launched seventy-nine bombs, weighing two kilos each, on the railway station and adjoining buildings at Conflans.

Two German aeroplanes were destroyed and another apparently was driven down out of control by American aviators on the Toul front.

All the American aviators returned safely, though they had been heavily shelled by anti-aircraft batteries.

An American observation balloon was shot down on June 16th by a shell from a German gun. There were no casualties as a result of the incident.

Another Escape

San Antonio.—Lieutenant "Pat" O'Brien, of Illinois, Royal British Flying Corps, who is in the United States after having escaped from a German war prison, fell nearly 2,000 feet in an aeroplane here, but was only slightly injured.

A postcard received from Germany states that Sergeant Carl Kerwood, of the Lafayette Escadrille, formerly of Bryn Mawr, Pa., who disappeared on March 31st, is a prisoner in Germany, and is in good health.

Clarence B. Shoninger, of New York, also a member of the Lafayette Escadrille, who disappeared on May 29th, when setting out for a patrol fight over the German lines, had just applied for transfer to the American force.

American Airmen in France

June 11

Brigadier General Benjamin D. Foulois has been detached from his post as chief of the air service of the American expeditionary force and appointed by General Pershing as head of the air service of the "first army."

This information was received June 11 from France. Colonel Robert N. Paddock will succeed General Foulois, probably with early promotion to the rank of Brigadier General.

June 12

Arthur Blumenthal, of Wilmington, N. C.; Harold Y. Saxon, of Washington, and Allan Nichols, of Palo Alto, Cal., all members of the Lafayette Escadrille, are missing after a bombing raid over the enemy lines.

Captain Charles Biddle, of Andalusia, Penn., who was recently wounded and brought down in No Man's Land on the British front, has recovered and resumed fighting.

June 13

Washington, June 13.—The following communique from General Pershing regarding aviation was issued June 13:

"Last night our aviators bombed with good effect the station of Dommary Baroncourt, northwest of Metz. All our machines have returned."

New Chevron for Short Service

Washington.—Special insignia to designate army service abroad of less than six months have been adopted by the War Department. Every officer, field clerk or enlisted man recalled from France prior to the completion of the half-year service, which would permit him to wear a gold chevron, will be authorized to wear a chevron of "sky blue cloth."

Huge Sirens to Warn City of Air Raids

Definite plans for installing warning sirens to notify the city in case of air raids have been completed by the Police Department, and the work of placing the big sentinels has begun. Two sirens have been placed in Brooklyn and it is planned to place a large number in New York.

Each siren, which will have a carrying power of from two to three miles, will be placed on an Edison plant. The authorities consider this will be more efficacious than installing them at random, for under the present plan one organization will have control of them all. The sirens will be connected by an electrical switch which will make it possible to sound them all at the same time.

Lieut. Keogh Honored

Lieut. Grenville-Temple Keogh, of the French Aviation Corps, who is at the home of his parents, Supreme Court Justice and Mrs. Martin J. Keogh, in New Rochelle, has received a bronze statue of a minute man from his friends and neighbors.

The affair was arranged by Columbus O'Donnell Iselin, who had the statue made. It is a reproduction of the figure of the minute-man monument at Concord.

Americans in R. A. F.

The Americans attached to the British air force are doing excellent work. A British staff officer, speaking with the corresponding, was high in his praise of their deeds. They are not only most able, he said, but they are congenial associates. The British have been delighted at the type of men who have come to them, and the relations between the Allies are eminently cordial.

Weather Conditions In America Cabled to Europe

Washington, D. C.—Even the weather in the United States is being watched from the western battle front in France. Like other events over here, such as the mobilization of man power and the conservation of food, the weather in the United States may vitally affect operations on the "frontiers of freedom."

Once every twenty-four hours a summary of weather conditions in the United States is cabled to officers of the Army who formerly were officials of the United States Weather Bureau.

The reason is that marked conditions of the weather in this hemisphere are likely to be reflected in the other, and the reason for that is the trend of the atmosphere toward the East. As the world revolves from east to west the atmosphere in mid latitudes tends to move constantly toward the rising sun. A great storm in this country may have its counterpart in greater or less degree in Europe some days later. Fair weather on this side may mean fair weather over there within a week. Supplied with this, in addition to local information, the "officers of the weather over there" are aided in forecasting conditions favorable for aeroplane activity, artillery work, or other military operations.

Trapshooting for Cadets

Trapshooting has been started for the benefit of the cadets at all aviation schools. The Government thus officially recognizes the value of a knowledge of trapshooting to the men who are training for this branch of the service. The most important part of their work will be shooting at a moving target, and trapshooting is designed to develop their skill in this direction.

Special Aviation Courses

A number of commissioned officers of the Aviation Section, Signal Corps, have just completed special courses in compass adjustment and air navigation. The Department of Military Aeronautics recently organized a school at Camp Dick, Dallas, Texas, for this advance instruction. The two courses were conducted at the same time and completed in two weeks. The two British officers who were the instructors have expressed themselves as pleased with the results accomplished and the spirit of the men. Capt. S. T. Fripp, Royal Air Force, was in charge of the compass classes. This course was designed to give engineer officers special instruction in the adjustment and compensation of aeroplane compasses. Those instruments get out of order because of the local magnetic fields set up by magnetos and engines, and from the jarring due to rough landings. The students who took this course were selected from graduates of the engineering ground officers' school at Massachusetts Institute of Technology. The course in navigation was conducted by Naval Instructor W. T. Farr, R.A.F. It consisted in instruction in air navigation, or flying by dead reckoning, the method of flying followed when the ground is not in view. Each of the flying schools in this country was represented in this course by an officers who had had charge of cross-country flying. The officers who finished this training will now return to their respective flying fields to instruct cadets in the subject.

Marooned In Hawaii

Military and civilian circles at Hilo, Hawaii, are rejoicing over the return in safety, from a two nights and a day exposure to the perils of the woods, of Major Harold M. Clark, Signal Corps, U.S.A., and his mechanician, Sergt. Robert P. Gray. They were lost in the clouds, after an aeroplane flight, and were forced to travel inland, where darkness compelled them to make a landing under perilous conditions. Without food they managed to exist two days, until after a struggle through the jungles, they finally found a way to the open and thence to one of the patrol stations. During their midnight flight, Major Clark managed, by skillful manipulation of his machine, to save both his own life and that of Sergeant Gray and to make a landing without accident to either.

Flew to Canada

Montreal, June 6.—Lieut. Georges C. Flachaire, the French ace, completed a flight from Washington, D. C., when he landed here last night. He started from Washington yesterday morning, and his route was via Buffalo, Toronto, and Brockville. The flight was undertaken in the interests of the bazaar opening here to-day for the aid of France.

Lieut. Lawrence Killed in Action

Lieut. Edgar Allen Lawrence, a member of the Aviation Corps, has been killed in action on the western front. He was a native of Chicago, twenty-four years old, and a graduate of the University of Illinois. Last September he enlisted and was sent to Toronto, Canada, for training. Then he returned to Fort Wood in New York harbor. Later he was sent to the aviation camp at Fort Worth, Tex., and last March went overseas.

THE PERSONAL DIARY OF LIEUT. ALAN F. WINSLOW

THE following personal diary of Lieut. Alan F. Winslow, Aviation Section Signal Reserve Corps, of Chicago, the first American aviator of the American Expeditionary Forces to bring down a German plane, is made public by the War Department. It was not written for publication, but is given out on account of its historical and descriptive value:

On Sunday morning, April 14th, I was "on alert" from 6:00 A. M. till 10:00 A. M., that is, I, with Lt. Douglas Campbell of Harvard and California (since designated as the first American "Ace") were on emergency call duty. We were sitting in the little alert tent, playing cards, waiting for a call. Our machines were outside, ready at a moment's notice. I was patrol leader. At 8:45 I was called to the 'phone, told by the information officer, who is in direct touch with all batteries and observation posts, that two German aeroplanes were about two thousand meters above the city, which is only a mile or so from here. We were told they were going east. We were rushed down to our machines in side cars, and in another minute were off in the air.

"Doug" started ahead of me, as I was to meet him above in a certain point at five hundred meters, and then take the lead. I gave him about forty-five seconds' start, and then left myself, climbing steeply in a left-hand spiral in order to save time. I had not made a complete half turn, and was at about two hundred and fifty meters, when straight above and ahead of me in the mist of the early morning, and not more than a hundred yards away, I saw a plane coming toward me with huge black crosses on its wings and tail. I was so furious to see a Hun directly over our Aviation field that I swore out loud and violently opened fire. At the same time, to avoid my bullets, he slipped into a left-hand reversement, and came down, firing on me. I climbed, however, in a right-hand spiral, and slipped off, coming down directly behind him and "on his tail." Again I violently opened fire. I had him at a rare advantage, which was due to the greater speed and maneuverability of our wonderful machines. I fired twenty to thirty rounds at him and could see my tracers entering his machine. Then, in another moment, his plane went straight down in an uncontrolled nose-dive—I had put his engine out of commission. I followed in a straight dive, firing all the way. At about six feet above the ground he tried to regain control of his machine, but could not, and he crashed to earth. I darted down near him, made a sharp turn by the wreck, to make sure he was out of commission, then made a victorious swoop down over him, and climbed up again to see if "Doug" needed any help with the other Hun:—for I had caught a glimpse of their combat out of the corner of my eye.

I rose to about three hundred again, to see "Doug" "on the tail" of his Boche. His tracer bullets were passing throughout the enemy plane. I climbed a little higher, and was diving down on this second Hun, and about to fire, when I saw the German plane go up in flames and crash to earth. "Doug" had sent his Hun plane down one minute after I had shot down mine.

Mind you, the fight took place only three hundred meters up, in full view of all on the ground and in the near-by town; and it took place directly above our Aviation field. Futhermore, mine dropped about one hundred yards to the right, and "Doug's" one hundred yards to the left of our field. These are remarkable facts, for one of our Majors, who, with the French army since 1915, has shot down seventeen machines, never had one land in France—and here we go, right off the bat and stage a fight over our aerodrome and bring down two Huns right on it. It was an opportunity of a lifetime—a great chance.

When we landed, only our respective mechanics were left in the "drome," to help us out of our flying clothes. The whole camp was pouring out, flying by on foot, bicycles, side cars, automobiles; soldiers, women, children, majors, colonels, French and American—all poured out of the city. In ten minutes several thousand people must have gathered. "Doug" and I congratulated each other, and my mechanic, no longer military, jumping up and down, waving his hat, pounded me on the back instead of saluting, and yelled: "Damn it! That's the stuff, old kid!" Then Campbell and I rushed to our respective Hun wrecks.

On the way there—it was only half a mile, I ran into a huge crowd of soldiers—blue and khaki—pressing about one man. I pushed my way through the crowd, and heard somebody triumphantly say to the surrounded man in French: "There he is; now you will believe he is an American." I looked at the man—a scrawny, poorly clad, little devil, dressed in a rotten German uniform. It was the Hun pilot of the machine I had shot down. Needless to say, I felt rather haughty to come face to face with my victim, now a prisoner, but did not know what to say. It seems he would not believe that an American officer had brought him down. He looked me all over, and then asked me in good French if I was an American. When I answered, "Yes," he had no more to say.

There was a huge crowd around the wrecked plane, and the first man I ran into was our major—the commanding officer,—and he was the happiest man in the world outside of me and "Doug." A French and an American General blew up in a limousine to congratulate us—colonels, majors, all the pilots, all the French officers, mechanics,—everybody in the town and camp. All had seen the fight. One woman, an innkeeper, told me she could sleep well from now on, and held up her baby for me to kiss. I looked at the baby, and then felt grateful to my major, who pulled me away in the nick of time. I had my mechanics take off everything available—the machine was a wreck—but I got some splendid souvenirs. The big black German crosses from the wings, his rudder, pieces of canvas with holes from bullets in them, all his spark plugs, his magnetos, his mirror, clock, compass, altimeter, his clumsy signal revolver, etc.—it is a great collection.

"Doug" had set his Hun machine on fire at three hundred meters, and it had fallen in flames, rolling over three times, and then completely burning up. There remained but a charred wreckage, like the sacrifice of some huge animal. The Hun pilot had been thrown out and was badly off. His face, hands, feet, nostrils and lungs were all burnt, while his leg was broken. He is now in the hospital and my Boche is probably commencing his job of ditch digging for the rest of the war.

They got much valuable information from my man—the other couldn't speak. He was a Pole, said he was not an officer because he was a Pole, although he had been an "aspirant" and a pilot at the front for two years. He said to me, with a sort of sigh of relief, throwing up his hands at the same time, "Alors, la guerre est fini pour moi!"

That afternoon my wrecked hun plane and the charred result of "Doug's" good work were exhibited in the public square of the town, surrounded by an armed guard, and overlooked by a French Military band. It also was a great day for the townspeople, and has had a good moral effect. You can imagine it, when you realize it took place above their roof tops, at only three hundred meters, and that they were able to see the whole fight. The Americans are indeed welcome in the town now, and "Doug" and I can buy almost anything half price.

An amusing incident was this: the fight was so near to the earth that bullets were flying dangerously all about the ground. No one was hurt, save a French worker in the field, who received a hole through his ear from one my bullets, and is very proud of it.

Two days later the two aviators were decorated by the French, in an impressive ceremony, with the Croix de Guerre with a Palm, and later were mentioned in General Orders and proposed for the American Distinguished Service Cross.

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Repairing a damaged plane at one of the American Flying fields in France

The AIRCRAFT TRADE REVIEW

N. E. J.

Spurs Aeroplane Output

Detroit.—John D. Ryan, Chief of Aeroplane Production, announced June 11, that Detroit manufacturers of aeroplanes and parts, including engines, would be asked to expand.

"I realize," he added, "that this city is already the largest aeroplane producer in the world; that the facilities and the men who know how are here. I have seen some wonderful things here. You have a production of aeroplane engines that is marvelous. It is far ahead of anything of a similar nature produced anywhere else, and, in reality the work is just beginning to get under way.

"Experience has shown that the Government method of doing business won't do," said Mr. Ryan, smiling to take the edge off the remark, "They don't get the results that are desirable and necessary. The only way to do business on the gigantic scale on which it must be done in this war work is to follow the line of business development of the centuries.

"The greatest development undoubtedly will be in the direction of the spruce forests of the West. Timber is the foremost requirement of aeroplane production just now."

Doehler Toledo Plant

The Toledo plant of the Doehler Die Casting Company which is housed in a model factory building completed a little over a year ago, has in this short space outgrown its quarters.

In order to provide for this expansion this company has found it necessary to take over the adjoining plant of the Ohio Electric Co., doubling the present capacity of the plant.

While the greater part of the plant's activities are devoted to Government war work, the needs of the regular trade are receiving the usual attention.

To Stop War Industry Congestion

Washington.—The adoption of a policy designed to reduce the congestion which is playing havoc with fuel and traffic conditions in the northeastern section of the country was announced jointly, June 11th, by the War Industries Board, the United States Fuel Administration and the Railroad Administration.

It has been decided that no further increase in the volume of war orders and the number of establishments handling them in the congested sections will be permitted.

The district affected comprises the New England States, Eastern and Southern New York, Pennsylvania as far west as Williamsport and Altoona, all of New Jersey and Delaware and Eastern Maryland, not including Baltimore.

Notice will be served immediately on the manufacturers engaged in production of war materials in this section that they must hold the volume of their business within certain limitations. The War Industries Board and the other Government agencies involved will be able to regulate the situation through Governmental control of the allocation of raw material, fuel and transportation facilities

Government Leaves Little Steel for Non-Essentials

The agreement reached by the War Industries Board and the American Iron & Steel Institute, by the terms of which the Government takes over absolute control of distribution of all manufactured products and pig iron, indicates that there will be little, if any, steel for non-essential industries during the remainder of the year. Whatever surplus production there may be, Chairman Bernard M. Baruch said, will be equitably distributed among the industries not engaged in war work. As the Government has placed orders aggregating approximately 18,000,000 tons or more than one-half the capacity for the last six months of this year, it is evident that companies not engaged in war work will get a small percentage only of their requirements.

The essential industries are classified as follows: Ships, including destroyers and submarine chasers. Aircraft. Munitions, military and naval supplies and operations; building construction for Government, etc. Fuel; domestic consumption, manufacturing necessities, etc. Food and collateral industries. Clothing. Railroads. Public utilities.

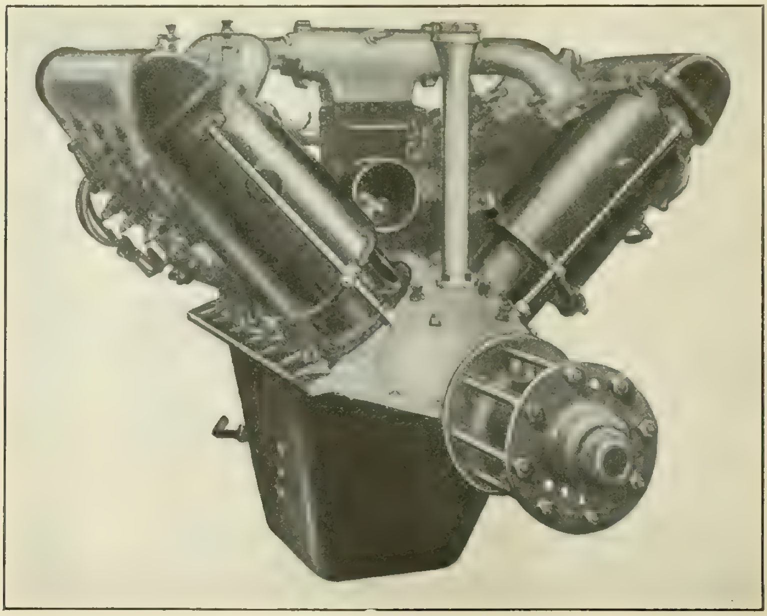
The Government will do all in its power to increase steel and iron production.

The Continental Aircraft Company's New Factory

The new factory of the Continental Aircraft Company is situated at Amityville, Long Island. It is a modern structure on the outskirts of the town with a large flying and testing field adjoining. The company has installed the most modern machinery for the rapid manufacture of aircraft, and expect to get into quantity production in the near future.

At the present time the company is working on a type of battleplane and a small speed scout. These will soon be completed and ready for testing.

Mr. V. Buranelli is the chief designer of the firm which at present employs about two hundred men.



A Hispano-Suiza aero engine constructed in a French factory

Maximum Aluminum Price 33 Cents

Washington.—The new maximum base price of aluminum from June 1, 1918, to September 1, 1918, has been set at 33 cents per pound, f. o. b. the United States producing plants, for 50 tons or over, of ingot of 98 to 99 per cent. This has been made by the War Industries Board and approved by the President, following co-operative investigations between the board and the Federal Trade Commission.

Personal Pars

Middletown, Conn.—Harold T. Woodley, of Great Necy Station, N. Y., who captained the football team at Wesleyan last autumn, has left college to become a naval aviator.

Pressed and Welded Steel Products Company, Inc., to Enlarge

The Pressed & Welded Steel Products Company, Inc., who have produced a large number and variety of Exhaust Headers and other part for Aeroplanes, will move into new and larger quarters, with increased facilities, in Long Island City, about July 1st.

Aircraft Organization in France

The shortage of training machines for the American Air Service students is disappearing and the ground work will be perfected for American air work on a large scale in the very near future. There are large production departments which are really huge assembling and testing centers, flying schools of huge proportions, repair shops and supply centers, all on the same big scale.

Already there are men on hand, plenty of them, to fill all these as soon as engines, parts and necessary materials arrive in volume, as they will very soon. It will not take long then for the original air program to materialize.

An inspection of several of these flying schools will show that the flying done there is well up to the standard of the British and French fliers.

No Cut for Aero Plants

In connection with the recent announcement of the Fuel Controller that there would be a 75 per cent cut in the allowance of coal to automobile manufacturers it was made very clear that this cut would not affect those firms as far as the manufacture of trucks was concerned. Neither Army truck nor aircraft parts manufacturers will be cut down in the matter of coal.

Cotton for Aeroplane Wings

In a paper "The Textile Industry in Relation to th War," which he read before the Spring meeting of the American Society of Mechanical Engineers at Worcester, J. E. Rousmaniere said that until recently it was thought that only linen would do for aeroplane wings. Cotton was thought to be unsuitable because of a marked tendency to expand and contract with variations in the amount of moisture present in the air and also because of a disposition to tear easily when shot through.

Experiments were made with mercerized yarn and they have shown that cotton so treated makes good aeroplane cloth and it is now said that such cloth is standing up as well as linen. Battleplane wings are still covered with linen, but cotton is used on practice and bombing planes.

When first tried out there was a feeling among aviators that they were not getting such good machines in the cotton wing aeroplanes, and they manifested some hesitancy about using them. A little actual experience in flying, however, soon demonstrated that the cotton wings are entirely satisfactory and this feeling on the part of the aviators is said to have entirely disappeared.

To Investigate New Gasoline Process

Washington.—A resolution introduced in the House of Representatives June 6 calls for an investigation by the Committee on Standards, Weights and Measures of a new process of extracting gasoline and other motor fuel from petroleum and fuel oil. The process is the discovery of S. N. Herber, St. Joseph, Mo., who says that he can extract the gasoline in greatly increased quantities and at much less than the present cost.

Personal Pars

H. G. MacEachen, Pacific Coast advertising representative of the Firestone Tire & Rubber Co., Akron, has resigned to join the United States Army.

Julian S. Friede, for the last two years in the engineering department of the Paige-Detroit Motor Car Co., has enlisted in the Canadian Royal Flying Corps. He will leave shortly for Toronto.

5,304 Miles Covered by Air Mail

Washington.—According to the Post Office Department, the aggregate flying distance covered by the aero mail service between New York and Washington during the second half of May was 5,304 miles, and the average rate of speed, 68 m.p.h.

Garabed Tests Approaching

Washington.—G. T. K. Giragossian, inventor of Garabed, a mysterious natural force, telegraphed the Department of Interior today: "My work excellent, can write definitely Wednesday." Members of the Scientific Test Board, appointed under Congressional resolution, have received word to be ready for the exhibitions.

Gasoline Output

Washington.—During 1917 the United States produced 342,000,000 bbl. of petroleum, equal to 68 per cent of the total world production. This is 3 per cent higher than the percentage for 1916, the largest percentage since 1875 and the largest total production in the history of the country.

Russia comes second in petroleum with a total of 65,000,000 bbl., which is only 18 per cent of the amount produced by the United States. Mexico is third with 55,293,000 bbl. Other countries produce so small an amount in comparison that they are practically negligible.

Production of oil during March reached a high mark. Crude oil was produced at the rate of 846,441 bbl. a day, as compared with a daily average of 815,330 bbl. in March, 1917. The total of gasoline was 269,627,968 gallons, or a daily average of 8,697,676 gallons. This is 50 per cent greater than the daily average for March, 1917. Production of kerosene also increased, but not in as large a ratio as gasoline.

Stocks on hand at the refineries on March 31 were far greater than the amount on Dec. 31. At the end of 1917 there were 412,256,833 gallons of gasoline stord away, and on March 31 this was increased to 526,382,386. Crude oil on March 31 was 13,122,241, as compared with 11,638,433 gallons stored away on Dec. 31.

Use Browning Machine Guns for Aircraft

Washington.—The Browning machine gun has undergone tests made to determine its value for use on aeroplanes, according to the War Department. The gun functioned perfectly, reports state, and as a result of the tests, the heavy type gun with the outer jacket removed will be used for aircraft.

The official announcement says:

"This is one of three types of machine guns with which the rate of fire can be so synchronized with the revolutions of the propeller of a tractor aeroplane that the gun can be fired by the pilot of a combat plane through the revolving blades. Firing in that fashion, it is necessary to aim the machine gun by steering the plane directly at the target. The direction of the plane gives direction to the fire and the pilot can fire the machine gun while controlling the plane.

"Aeroplane propellers revolve at from 600 to 2,000 revolutions per minute. The machine gun is connected with the aeroplane engine by a mechanical or hydraulic device, and impulses from the crankshaft are transmitted to the machine gun. The rate of fire of the machine gun is constant and its fire is synchronized with the revolving propeller blades by "wasting" a certain percentage of the impulses it receives from the aeroplane engine and by having the remaining impulses trip or pull the trigger so that the gun fires just at the fraction of the second when the propeller blades are clear of the line of fire.

"The pilot operates the gun by means of a lever which controls the circuit and allows the impulses to trip the trigger.

"The test given the Browning gun was severe. A gun was mounted on the frame of an American combat plane and connected with the aeroplane engine. The test was conducted on the ground and in place of the propeller a metal disc was attached to the crankshaft. The browning gun was then required to register hits on the metal disc as it revolved at verying speeds from 400 to 2,000 revolutions per minute. The slightest "hang fire" or delay in action on the part of the gun would have been shown by the failure of the bullets to hit precisely on the spot on the disc representing the center of the zone of fire. The gun functioned perfectly.

"The Browning gun to be used with aircraft is the heavy type with the water jacket removed.

"Besides the Browning, the United States will also employ the Marlin aircraft gun as a synchronized weapon. Several thousand of these have been manufactured and the gun is in quantity production.

"The British and French use the Vickers as a synchronized machine gun.

"The Lewis aircraft machine gun is used by the British, French and American forces, but for a different purpose. In a two-seater combat plane, fixed machine guns are mounted forward to be operated by the pilot and flexible guns are mounted to be operated by the observer in the rear seat of the plane. The observer operates Lewis guns on flexible mounts, firing to right or left of the plane.

"It is of vital importance to have absolute reliability of function in a synchronized machine gun on tractor aeroplanes. Delays in fire or malfunctions due to faulty construction or imperfect ammunition causes bullets to strike the propeller blades. As many as fifteen bullets have been known to strike a propeller blade without causing an aeroplane to fall, but the danger of such occurrences is nevertheless obvious. For that reason, every effort is made to provide the most perfect type of weapon for this work. Only specially selected ammunition is used.

Windows Protected from Air Raid Bombs

Paper strips, pasted in curious geometrical designs on a large show window on the Broadway side of the John Wanamaker store, attracted a crowd of curious persons yesterday. A note in the window explained they were pasted to hold the glass together in case air raiders drop bombs in the vicinity. The strips, one and a quarter inch wide, covered the show window of the furnishings department in the new building, but did not obscure an interesting display.

The John Wanamaker decorators have adapted a French idea. New York stores probably will follow the lead of most of the Paris stores.

The assembly room of the aeronautic department of the Fiat plant at Turin, Italy. Italian Official Photo.

THE AUSTRIAN BERG SINGLE-SEATER FIGHTER

SIMPLICITY would appear to be the keynote of design in the Austrian Berg single-seater fighter, both as regards mass, or aerodynamic, design and structural design. The machine has every appearance of being designed chiefly with a view to rapidity of production, yet this object has been attained by a studied simplicity of detail rather than by any scimping in workmanship. In fact, although the finish is not, perhaps, as good as on some machines, the workmanship appears everywhere to be really quite good, and the materials employed in the construction are, if anything, better than found on a good many German machines. Whether this is due to a more plentiful supply of the right materials in Austria than in Germany, or whether Austrian inspection is stricter than that obtaining in Germany, is difficult to say, and one can only call attention to the fact without venturing an explanation.

Fundamentally the Austrian Berg is of the single-seater fighter type in which the pilot and top plane are so placed in relation to each other that the wing obstructs the view to a very small extent only. This has been accomplished, not so much by reducing the gap to a smaller proportion of the chord than usual, as by making the body very deep and placing the pilot fairly high inside the body. On closer examination it is found that the extra depth of the body is provided by deepening the turtle back, which forms a much greater proportion of the overall depth than is the case in most machines.

The body proper, which is of the flat-sided variety, is constructed on similar lines to those of the older models of Albatros biplanes, *i.e.*, of *longerons* and struts of fairly small section, the whole being covered with three-ply wood. As distinct from the Albatros, however, there are only four *longerons*, the auxiliary rails halfway up the sides of the latter having evidently been deemed unnecessary by the designer of the Berg. The turtle back, which is different from the majority in that it does not, except in front, cover the whole width of the flat top of the body, but comes to a point just in front of the vertical fin, is of a peculiar section. This may, in the absence of a sketch, best be described by saying that it consists of three curvatures, a convex at the top, a concave halfway down, and again a convex at the bottom. The object, evidently, is to provide stream lining of the pilot's head by having the turtle back deep without, however, obstructing the view to too great an extent by having it very wide. Roughly the configuration is that of a man's head and shoulders.

The pilot's cockpit is very comfortable, the deep top efficiently screening his face while at the same time, owing to the peculiar outline, not obstructing the view to as great an extent as one would imagine. By leaning his head slightly the pilot can easily look past the nose of the machine, so that there is really no "blind" spot beyond a few yards ahead of the machine. The fact that the chord line of the upper wing if projected passes through the pilot's line of vision renders the view forward and upward particularly good. Small circular windows are inserted in the turtle back in front of the pilot, but it appears that the view obtainable through these is of very little practical utility, and the inference is that they are placed there to admit light on to the instrument board rather than to provide direct vision.

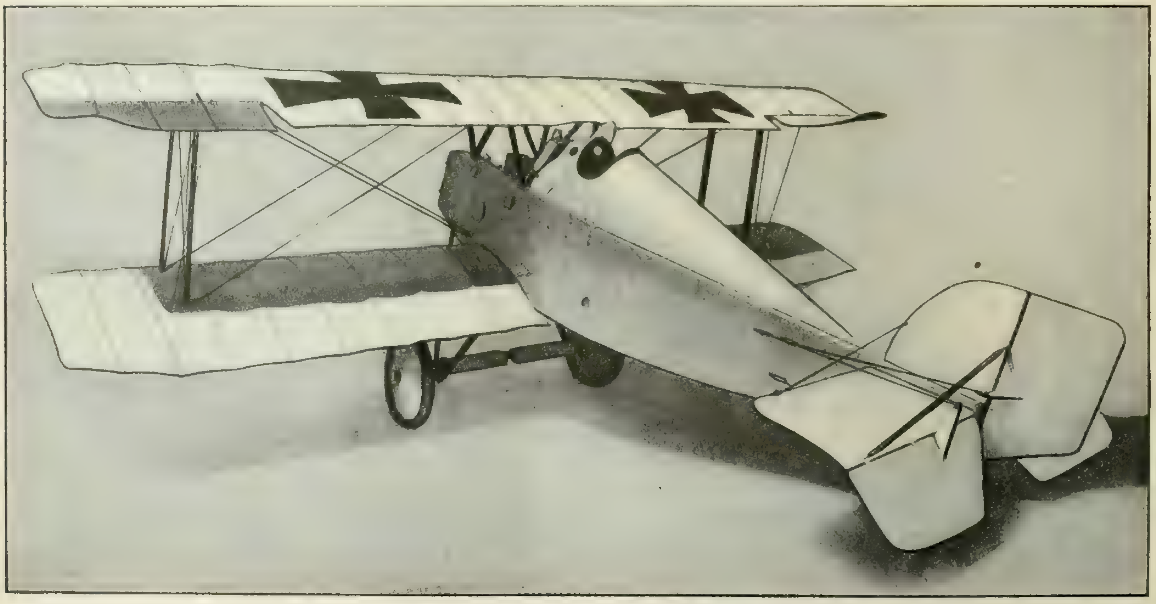
The pilot's seat is extremely comfortable, and is provided with arm rests, thus enabling the pilot to rest one arm while working the control lever with the other. For a long flight this makes for comfort. It is only a minor point, it is true, but one nevertheless which is worthy of consideration. On the whole the machine gives the impression that it would be a very comfortable machine to fly, regarded purely from the flying point of view, and without knowing anything about its capabilities as used for fighting.

The controls are more or less of the usual type. There is a longitudinal rocking shaft, mounted rather higher above the floor boards than is generally the case. The control lever is forked around this shaft, and is free to oscillate forward and backward for operating the elevator. A short length of cable passes from the lower end of the "joystick" to a point on the floor boards. This limits the extent to which the lower end of the lever can move back, and has the effect of preventing, when on the ground, the elevators from touching and getting damaged. In connection with the lateral controls, the wing flaps are fitted with cranks resting in slots in the planes, and there is a somewhat unusual arrangement whereby the *positive* cable is taken to the front arm of the crank, so that it is the return cable which pulls the wing flap down. The reason for this may be found in the warped wing flap, which may conceivably have its outer tip tilted upwards to such an extent that the effect of moving the flaps is to put a force acting downward on the flap moved upwards before the flap on the opposite side, which has, of course, been moved down simultaneously, receives an upward force. To bring this peculiar action about the crank on the rocking shaft points downwards instead of, as is more usually the case, pointing upwards.

The foot bar operating the rudder is of the T type. That is to say, the rudder control cables are attached to a crank arm projecting forward at right angles to the foot bar. The cables are then taken around pulleys near the side of the body, and hence to the rudder cranks. The guards on the rudder bar, which prevent the accidental slipping off of the pilot's feet, are in the form of spiral springs, each composed of two layers, an inner spiral of fairly thin wire, and an outer spiral of heavier wire.

The engine, which, we are informed, was a 200 h.p. Austro-Daimler, is not shown in place on the machine, but it would appear to have been totally covered

(*Concluded on page* 725)

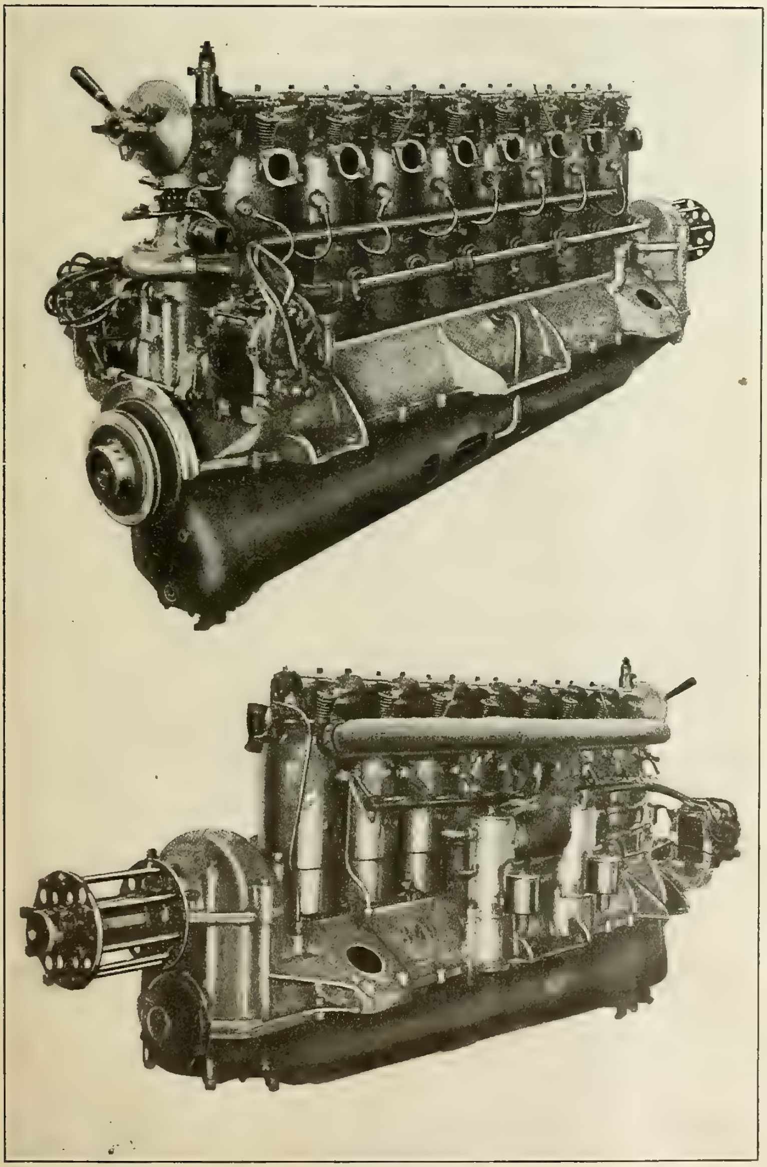


The Austrian Berg Single-Seater Fighter

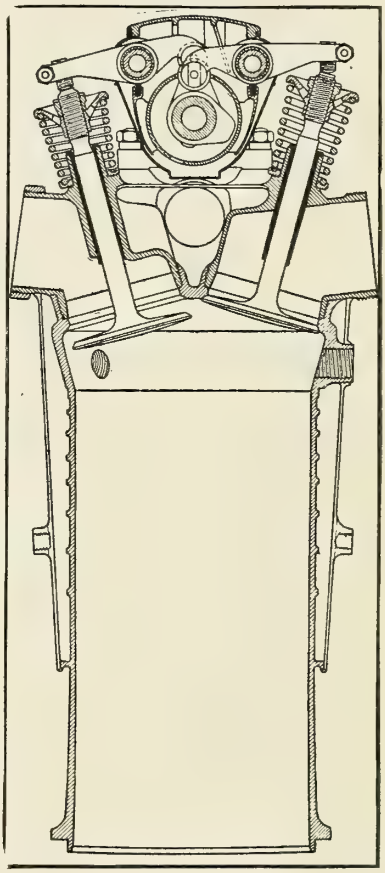
THE 240 H.P. (8-Cylinder) MERCEDES

THE following detailed report on the design of the 8-cylinder Mercedes engine is based on an investigation of the engine (No. 23,003) taken from the German two-seater Albatross Biplane (G.37) which was brought down by anti-aircraft guns near Armentières on May 12th, 1917. This engine has been tested at the Royal Aircraft Factory and results of B.H.P. developed, petrol and oil consumption, etc., during tests are given herewith, together with details of the engine design and the leading particulars of the engine. Although this engine, according to reports, is now obsolete, the design having been abandoned in favor of the German standard six-cylinder vertical type, details and illustrations of the engine will no doubt prove of considerable interest, more particularly to those interested in the design of the special engines used for airship work.

In its general details this engine follows closely the design of the 160 H.P. Mercedes engines as regards the construction of the cylinders, pistons, valve gear, etc., and also in the lubrication system. It is therefore very similar to the 160 H.P. engine, with an extra pair of standard cylinders and a massive propeller shaft reduction gear, and the necessary alterations to the design of the crankshaft and the induction system, and in consequence of this similarity in detail to the 160 H.P. Mercedes, it will be unnecessary to deal at any length in this report with the design of those parts of the engine which are identical, a report on the former having already been issued, and the design being now well known in this country.



The 240-H.P. Mercedes Motor



The Mercedes Cylinder

Engine Data

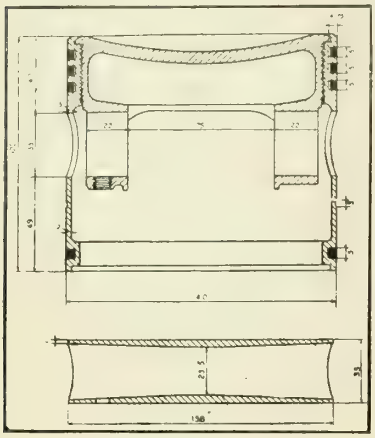
Number and arrangement of cylinders, eight, vertical, separate; bore, 5.51 ins. = 140 mms.; stroke 6.30 ins. = 160 mms.; stroke/bore ratio, 1.142:1; area of one piston, 23.84 sq. ins. = 153.9 sq. cms.; total piston area of engine, 190.83 sq. ins. = 1231 sq. cms.; stroke volume of one cylinder, 150.28 cu. ins. = 2463 cu. cms.; total stroke volume of engine, 1202.24 cu. ins. = 19704 cu. cms.; volume of clearance space, 40.30 cu. ins. = 660 cu. cms.; compression ratio. Total volume/Clearance volume, 4.73:1.

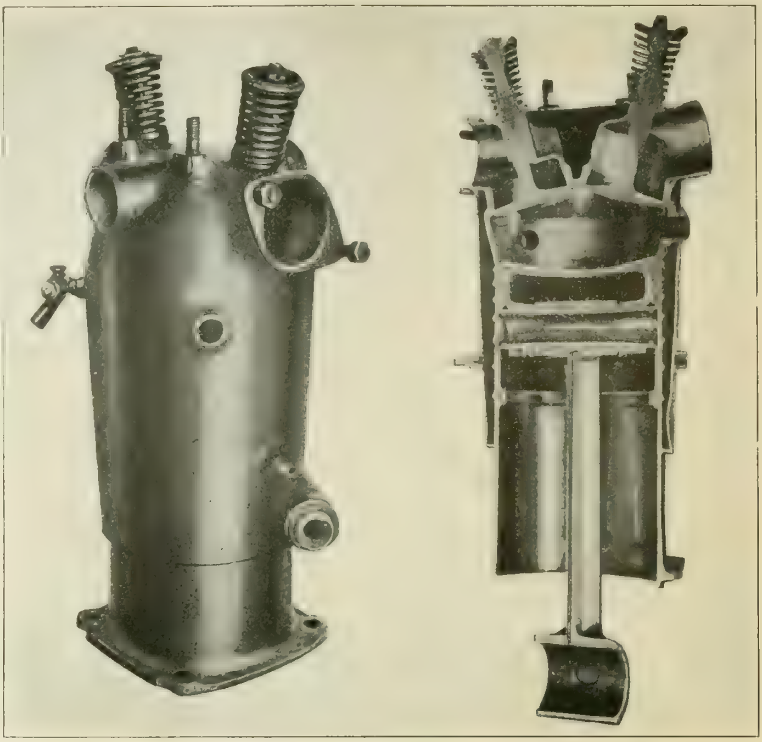
Max. B.H.P. and speed, 287 B.H.P. at 1750 r.p.m.; normal B.H.P. and speed, 242 B.H.P. at 1350 r.p.m.; piston speed at normal speed, 1418 ft. per min.; brake mean pressure at normal speed, 118 lbs. sq. in.; cu. ins. of stroke volume per B.H.P., 4.97 cu. ins.; sq. ins. of piston area per B.H.P., 0.788 sq. in.; B.H.P. per cu. ft. of stroke volume, 348.0; B.H.P. per sq. ft. of piston area, 182.7.

Direction of rotation of crank, anti-clockwise, facing propeller; direction of rotation of propeller, left hand tractor; normal speed of propeller, 977 r.p.m.; ratio of crankshaft speed to propeller speed, 1.382:1; type of gear reduction to propeller, Spur gear.

Lubrication system, forced, multiple plunger pumps; oil temperature, 37.5° C. (test figures); oil consumption per hour, 10.16 pints = 11.43 lbs.; oil consumption per B.H.P. hour, 0.042 int = 0.047 lb.; specific gravity of oil, 0.900.

Type of carburetors, Two, Mercedes, twin-jet; diameter of chokes, 0.945 in. = 24 mms.; bore of main jets, 0.078 in. = 2 mms.; bore of pilot jets 0.0197 in. = 0.5 mms.; fuel consumption per hour, 141.3 pints = 127.1 lbs.; fuel consumption per B.H.P. hour, 0.582 pint = 0.524 lb.; specific gravity of fuel, 0.720; inside diameter of induction pipes, 2.125 ins. = 54 mms.





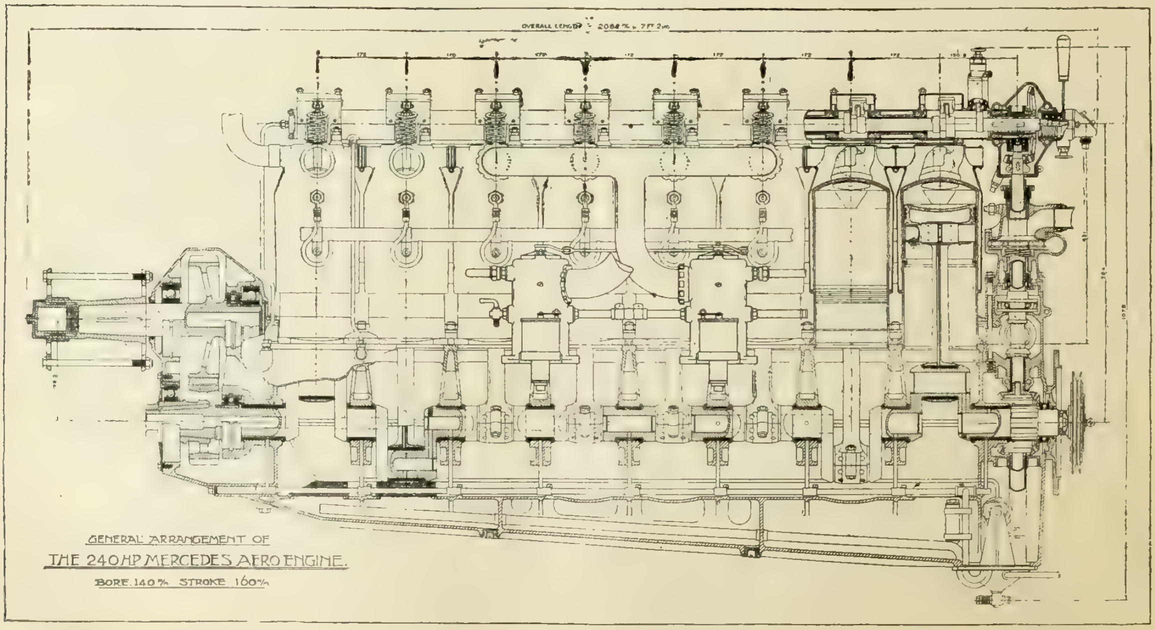
The cylinder construction of the Mercedes motor

Type of magnetos, two Bosch, H.L.8; firing sequence of engine, propeller, 1-3-2-4-8-6-7-5; speed of magnetos, engine speed; magneto timing (degrees early full advance), 30° early.

Inlet vale opens. Degrees on crank, 2° late; inlet valve closes. Degrees on crank, 51° late; diameter of inlet valve (smallest diam.) = *d*, 2.677 ins. = 68 mms.; lift of inlet valve = *h*, 0.450 in. = 11.4 mms.; area of inlet valve opening ($\pi\ d\ h$), 3.780 sq. ins. = 24.40 sq. cms.; mean gas velocity through inlet valve at normal speed, 149.5 ft. per sec.; clearance of inlet tappet, 0.012 in. = 0.305 mm.

Exhaust valve opens. Degrees on crank, 52° early; exhaust valve closes. Degrees on crank, 16.5° late; diameter of exhaust valve (smallest diam.) = *d*, 2.677 ins. = 68 mms.; lift of exhaust valve = *h* 0.412 in. = 10.48 mms.; area of exhaust valve opening ($\pi\ d\ h$), 3.460 sq. ins. = 22.4 sq. cms.; clearance of exhaust tappet, 0.018 in. = 0.457 mm.

Weight of engine complete, without water, fuel or oil, 900 lbs. (including exh. manifold and propeller hub); weight per B.H.P., 900/242. 3.72 lbs. per B.H.P.;



GENERAL ARRANGEMENT OF
THE 240 HP MERCEDES AERO ENGINE.
BORE 140 m/m STROKE 160 m/m

weight of exhaust manifold, 19.5 lbs.; weight of oil carried in engine, 17 pints = 19.13 lbs.; weight of fuel per hour, 127.1 lbs.; weight of oil per hour, 11.44 lbs.; total weight of fuel and oil per hour, 138.5 lbs.; gross weight of engine in running order, less fuel and oil, 1057 lbs. (including cooling system, 242 × 0.65 lbs.) weight per B.H.P., 1057/242. 4.37 lbs. per B.H.P.; gross weight of engine in running order with fuel and oil for six hours, 1971 lbs. (tanks at 10 per cent. of weight of fuel and oil); weight per B.H.P., 1971/242, 8.15 lbs. per B.H.P.

Delivery of water pump at 1350 r.p.m. of engine, 91 galls. per min.; water jacket capacity of one cylinder, 1280 cu. cms.; ratio of water pump speed to crankshaft speed, 1.5:1; water temperature. Inlet, 65° C.; water temperature, outlet, 78° C.; diameter of water pump inlet and outlet, 1.37 ins. = 35 mms.

During calibration tests at the Royal Aircraft Factory, the engine showed a very good general performance, developing a maximum of 286 B.H.P. at 1,750 r.p.m., and an average of 242 B.H.P. at a normal crankshaft speed of 1,350 r.p.m.

Summary of Test

Average petrol consumption per hour	141.3 pints
Average petrol consumption per B.H.P. Hour	.582 pint
Average oil consumption	.042 pint/B.H.P. hour.
Oil temperature.....	37½° C.
Max. B.M.E.P. at 1,100 r.p.m.........	120 lbs./sq. in.
Average B.M.E.P. at 1,350 r.p.m.........	118 lbs./sq. in.
Compression ratio...	4.73:1.

General Analysis of Weights

Description of Part	No. per set	Average unit weight in lbs.	Weight of complete set in lbs.	Percentage of total weight
Cylinders (bare)	8	19.25	154.00	17.111
Pistons complete with rings and gudgeon pins.	8	6.85	54.80	6.088
Connecting rods complete with floating bushes	8	5.00	40.00	4.444
Valves, inlet and exhaust, complete	16	1.312	20.992	2.332
Crankshaft, with floating bevel gear	1	94.50	94.50	10.500
Camshaft and case with half compression gear.	1	60.00	60.00	6.666
Reduction gear (large) with propeller shaft and bearings, complete	1	45.00	45.00	5.000
Reduction driving gear on camshaft, complete with bearings and thrust race	1	23.25	23.25	2.583
Base chamber (top half)	1	103.75	103.75	11.527
Base chamber (bottom half)	1	113.00	113.00	12.555
Carburetors, complete	2	8.00	16.00	1.777
Induction pipes, complete	2	7.25	14.50	1.611
Oil pump, complete	1	12.50	12.50	1.388
Water pump, complete	1	9.00	9.00	1.000
Vertical driving shaft, including magneto driving bevels and couplings, &c.	1	12.50	12.875	1.430
Propeller hub, complete	1	17.875	17.875	1.986
Magnetos	2	17.25	34.50	3.822
Ignition wiring, complete	2	2.50	5.00	.555
Exhaust manifold	1	19.5	19.5	2.166
Miscellaneous parts	—	——	48.958	5.439
Total weight of complete engine	—	——	900.00	100

Water pump delivery at normal engine revs. against a pressure of 2 lbs. per sq. in. = 91 galls./min.

The total weight of complete engine, dry, including propeller hub and exhaust manifold = 900 lbs., equivalent to 3.72 lbs. per B.H.P.

An attempt was made to throttle the engine below 900 r.p.m., but the running was irregular.

During a power and consumption run of 1 hour's duration an average of 267 B.H.P. was developed, at an average speed of 1,550 r.p.m., and at an average petrol consumption of 155 pints per hour = .582 pint per B.H.P. hour.

Oil consumption = 10.10 pints per hour = .042 pint per B.H.P. hour.

Water temperature, inlet = 65° C.; outlet = 78° C.

This test should not, however, be taken as representing the normal performance of the engine, as the average speed at which it was run, namely 1,550 r.p.m., is higher than that which would be obtained for any length of time in the air.

Details of Construction

Cylinders.—These, as already stated, are of the standard 160 H.P. type, and are made entirely of steel, being built up of machined steel forgings with the valve pockets screwed and welded into the cylinder-head. The water jackets are of sheet steel, 1.5 mm. gauge, all joints being acetylene-welded in position. The single inlet and exhaust valves are operated by the usual Mercedes type overhead camshaft and valve gear, which is fitted with the well-known half compression gear at the rear end of the camshaft casing. This design of half compression gear is used on all types of Mercedes engines, including the 260 H.P., and the latest 180 H.P. Mercedes engines (a report on which is in preparation, and will be issued shortly).

Pistons.—Standard 160 H.P. pistons are used with concave steel crowns, screwed and welded into the cast iron skirts, which are fitted with three rings above the gudgeon pin and one at the bottom of the skirt.

OFFICIAL SPECIFICATIONS FOR ARMY AEROPLANE LUBRICANT

THIS specification has been approved and adopted by the Ordnance Department, the Quartermaster Corps, the Engineer Corps, the Medical Corps and the Signal Corps, U. S. Army.

General

1. This specification covers the requirements of the U. S. Army in all purchases of oil to be used for the lubrication of stationary cylinder aircraft engines.

2. It is intended to use the name "Liberty Aero Oil" for all oils approved for the lubrication of these engines. On account of differences in characteristics of the high and low specific gravity oils, this specification is drawn to cover both types of oil and to include products manufactured from crude petroleum oils from all fields. For the purposes of this specification, oils are classified as follows:

Classification

3. High specific gravity oils.—This class includes all oils having a specific gravity above 0.9100 (or below 24 deg. Baume conversion by the Tagliabue Manual, 9th Edition, or above 23.85 deg. Baume conversion by the Bureau of Standards' conversion table, Circlar No. 57)—and having a pour test below 15 deg. Fahr. (Tested by the method of the American Society for Testing Materials.)

4. Low specific gravity oils.—This class includes all oils having a specific gravity below 0.9100 (or above 24 deg. Baume conversion by the Tagliabue Manual, 9th Edition, or above 23.85 deg. Baume conversion by the Bureau of Standards' conversion table, Circular No. 57)—and having a pour test 15 deg. Fahr. (Tested by the method of the American Society for Testing Materials.)

Physical Properties and Tests

5. The oil must be made from pure, highly refined petroleum products, and must be suitable in every way for the entire lubrication of stationary cylinder aircraft engines operating under all conditions.

6. The oil must be neutral in action and must not show the presence of moisture, sulphonates, soap, resin or tarry constitutents which would indicate adulteration or lack of proper refining.

7. Viscosity.—The viscosity of the oil, when tested in a Saybolt Universal Viscosimeter at 212 deg Fahr., shall be as follows:

High specific gravity oil, 70 seconds to 75 seconds.

Low specific gravity oil, 85 seconds to 90 seconds.

8. Pour test.—The oil must pass the following pour test:

Hight specific gravity oil, not over 15 deg. Fahr.

Low specific gravity oil, not over 40 deg. Fahr.

9. Flash point.—The oil must have a flash point over 350 deg. Fahr., in a Cleveland open cup.

10. Carbon.—The oil must not show a carbon residue of over 1.5 per cent by the Conradson method. The carbon shown must be loose and flaky and must break up easily in the crucible.

11. Emulsion test.—One ounce of oil shall be placed in a standard four-ounce sample bottle with one ounce of distilled water. The mixture shall be heated to a temperature of 180 deg. Fahr., and then shaken vigorously for five minutes. After standing for one hour, the oil must be clear and of the same color as before the test. All of the water must have settled and appear only slightly cloudy.

12. All tests must be made in accordance with methods adopted by the American Society for Testing Materials.

Statement to Be Submitted by Bidders

13. The bidder must state in his proposal the following characteristics of the oils which he proposes to furnish:

Gravity, Baume, at 60 deg. Fahr.
Flash, Cleveland open cup.
Fire, Cleveland open cup.
Viscosity, Saybolt Universal Viscosimeter, at 100, 130 and 212 deg. Fahr.
Pour test, American Society for Testing Materials' method.
Carbon, Conradson method.
Color, Lovibund.

(*Concluded on page 725*)

STEEL TUBES, TUBE MANIPULATION, AND TUBULAR STRUCTURES FOR AIRCRAFT*

By W. W. HACKETT and A. G. HACKETT, of Oldbury, Birmingham

Introduction

THE present decade will pass down into history notorious for many things good and bad. It will be styled a time of improvement in many ways. It will be remembered as covering the period of the world's greatest war, but it will also be remembered among all trades appertaining in any way to engineering as the age of progress in the manufacture and manipulation of steel tubing.

Independent altogether of the stimulus given to the use of tubing for structural work by the advent and advance of aeronautics, the uses to which tubing of steel and other metals is put has increased considerably during the past few years. Much, of course, has been due to the large output of cycles and motorcycles, but in addition an immense quantity of tubing is used in the construction of motor-cars, and in a thousand other productions which it is unnecessary to particularise in this paper.

The section of tubular work in which we are more especially interested at the moment, however, is that which has relation to aircraft construction, and in this paper we hope to deal with some of the main features of this important subject, giving a brief review of the method of manufacture generally employed, of some of the difficulties that have had to be overcome, and of some of the forms of manipulation which it is possible to put upon good quality steel tubing. The latter part of the paper will deal with tests carried out on specimen tubes, under various conditions, and jointed together in different ways. All that we have to say will apply to seamless steel tubing.

Seamless Steel Tubing

In dealing with such a subject as this, other articles must be brought under review, such, for instance, as lugs and liners, as these enter so largely into the construction of articles built mainly of steel tubing. Mention will be made of cycle and motorcycle experience in the use and abuse of steel tubing.

Seamless steel tubing is a product of modern times, some thirty-five years having passed since the first experiment was successfully carried through. Its commercial production has often made possible the manufacture of articles which could not otherwise have been made, and in other cases it has been the means of popularizing articles which were having a very small sale, and which were even looked upon as freaks. Many present will remember the old bicycles which were built of gas pipes and solid pieces of iron, and will have recollections of the energy taken to propel these machines, especially up an incline! The coming of seamless steel tubing soon altered that, and a few years later cycle frames were being built of light gauge tubing, enabling a man to propel himself at ten to twenty miles an hour on a structure weighing about 30 lbs. Two things made the cycle a commercial success: pneumatic tires, which made riding more comfortable, and light gauge steel tubing, which brought down the weight of the cycle to a minimum. A further word must be said for the pneumatic tires—namely, that by minimizing the shock to the frame made possible the introduction of lighter gauge tubes than could otherwise have been safely used.

How Seamless Steel Tubing is Made

To commence the manufacture of a seamless tube a solid billet of steel, well hammered and rolled, is taken. This billet must be carefully examined for various faults, and any lamination or surface defect removed by chipping, or else the outside of the billet must be turned all over. The usual practice when the latter is done is to turn about ⅜ in. off the diameter of the billet.

Hot-Rolling

The first operation is then to pierce a hole. Two ways of doing this are in general use: one is by means of a hydraulic press, similar to the method of piercing shells so common in this country to-day, and the other by means of a rotary piercing machine. The billet, first centered with large shallow holes, is heated to about 1,200° C. and fed between rolls having a curved outline and set at an angle which imparts a forward movement to the billet as it is rotated. Great pressure is used (which causes the billet to tend to open along its axis), and the billet is forced against and over a pointed mandrel held on the end of a stout rod, which butts against a bracket at a distance of about 7 ft. from the center of the rolls. A billet, 4 ins. diameter by 24 ins. in length, will be made in one operation into a tube about 4 ft. to 5 ft. long. The pierced billet is then taken to another machine which is provided with upper and lower rolls having semi-circular grooves of various radii, and by a series of operations is rolled into a tube of the required size. The tube is passed over mandrels to give the required thickness.

A much quicker process of rolling mild steel tubes is by means of Pilger rolls; but for high carbon steel or chrome nickel steel this process has been found to be unsuitable.

Cold Drawing

The first operation in the cold drawing mills is that of "tagging" the hollow bloom (as the rough rolled tube is called) being reduced at one end by suitable semi-circular tools in a power-forging hammer. The tube in the drawing operations to follow will be pulled through the dies by means of the "tag" thus formed. A small hole is put into the tube at the point where the tag commences, in order to allow acid and water to work through the tube in the subsequent pickling and swilling processes. After being "tagged" the tube is annealed, pickled in a bath of acid to remove the scale, and then swilled in clean water. Following this, the tube is dried and then immersed in a solution of soap, or in oil, to lubricate it for the drawing operation. It is now ready for drawing.

There are two methods of cold drawing in general use. One is by drawing down the outside diameter of the tube upon a long bar of uniform diameter and then passing the tube, while on the bar, through rolls fixed in a "reeling" machine, which is similar to that used in the rotary piercing operation. In carrying out this method the tube is put on to the bar, which must of necessity be smaller than the bore of the tube to be drawn. The tube and the bar are then pulled through a die of hardened steel of such a bore as will give the proper reduction of gauge to the tube. The tube is gripped on the "tag" by means of "dog" jaws sliding on inclined planes. The "dog" is moved along the draw-bench by hooks which are dropped into the links of an endless chain. The chains move at a sped of from 12 ft. to 35 ft. per minute, according to the class of material to be drawn. This process of cold drawing permits of a greater reduction of thickness at each draw than can be obtained by the more usual process of plug drawing, but is rather harsh on the material, and the expand- of the tubing (already hardened by drawing) to allow the mandrel to be extracted sometimes causes splits and fractures. These are more likely to appear if this process is used after the tube has been drawn to a light gauge.

The second method is that known as "plug drawing," and is more usually adopted; in this case a short, hardened mandrel is screwed into one end of a long bar. This bar is screwed at the other end into a larger piece of steel known as the "back sleeve," which is screwed and fitted with a nut at either end. This sleeve has an axial movement of about 9 ins. in the back casting of the draw-bench. The nut at the back is used for the purpose of adjusting the position of the mandrel in relation to the die.

The tube is threaded over the mandrel and the "tag" is passed through the die, which rests against the die plate. Immediately the tube is gripped by the "dog" it commences to move, the mandrel at the same time being drawn forward into position by means of a rope or chain. A reduction in gauge thickness and diameter, with an increase in length, is the result, due to the walls of the tube being drawn down between the mandrel and the die. The usual reduction by this method is about a gauge and a half per draw on low carbon steel. The operation of cold drawing hardens the tube to quite a large extent, and subsequent annealing is necessary.

Annealing

A properly annealed tube showing an ultimate tensile stress of about 30 tons per square inch should give about 38 tons after undergoing the drawing operation. To prepare the tube properly for further cold drawing it is therefore necessary to anneal after every drawing operation, which means it has also to be pickled, washed, dried, and lubricated. A hollow bloom of 1⅞ in. diameter by 8 in. gauge would require nine or ten "draws" to make it into a tube 1¼ in. by 22 in. gauge. The annealing is carried out in suitable muffles, usualy at a temperature of about 600° to 650° C., until before the last "draw," when a temperature of about 850° C. is advisable. In the case of light gauge tubes, this should be done by "close" annealing, as the scaling and blistering of a light tube by "open" annealing would be fatal.

When a tube has been drawn to about 7/16 in. diameter there is great difficulty experienced in drawing on a mandrel. The usual practice is to finish ⅜ in. diameter tubes and smaller by reducing the diameter only, termed "sinking." The condition of the tube finished in this way is not so good as when finished on a mandrel, the strength of the tube being less. From experiments made, tubes from 5 per cent. carbon steel finished by "sinking" show about the same tensile strength as tubes from 35 per cent, carbon steel finished with the usual "draw" on a mandrel.

Chrome Nickel Tubes

The advent of aeroplanes and airships has given rise to a demand for steel tubing of a higher class than before, tubes of high carbon and alloy steels being called for. This has meant careful investigation in order to find the best heat treatment to be accorded in each particular case. The first attempts at drawing chrome nickel steel were scarcely a success, and many breakages of mandrels and even draw-benches resulted from the unsatisfactory annealing of these tubes. Chrome nickel tubes are now being successfully drawn by the same methods as are used for mild steel tubing—by means of "plug drawing"—but very great care needs to be taken in the annealing.

The amount of reduction in gauge per draw is less than half that which is usual in the drawing of mild steel, but in spite of this the wear on mandrels and dies is very great.

A typical analysis of chrome nickel steel is as follows:

Carbon	.3	per	cent
Silicon	.16	"	"
Sulphur	.03	"	"
Phosphorus	.03	"	"
Manganese	.45	"	"
Chromium	1.10	"	"
Nickel	4.00	"	"

Such a steel, when air-hardened, has an ultimate tensile stress of about 100 tons, but a low elastic limit to a maximum value of about 70 tons. Tempering will raise the yield point and at the same time slightly reduce the ultimate stress. This steel is being much used for aeroplane axles. One feature that should be mentioned here is the very serious effect of suphuric or muriatic acid on hardened chrome nickel steel tubing. It has the effect of making the material exceedingly brittle. It is therefore inadvisable to use acid to remove scale from a hardened chrome nickel steel tube; but the injurious effect of the acid can be almost entirely removed by suitable heat treatment.

Acid affects other high tensile steels in the same way, but to a less degree, and has a considerable effect even on mild steel.

Section Tubing

Section tubing has been extensively called for by aeroplane designers, and streamline tubing is used to quite a large extent. The first streamline tube our company (Accles and Pollock, Ltd.) were asked to make was designed by Mr. Howard T. Wright in 1908, and is a section that is very near to the recognized standard of to-day. Section tubing, the streamline-shaped tube especially, is much easier to make if straight sides are avoided, as straight or concave sides compel the use of mandrels and add to the difficulty of production. There are three ways of making sections from seamless tubing—namely, by drawing, rolling and pressing. Pressing is only practicable on fairly short lengths. In drawing there is a slight reduction in periphery in passing from the round, but in rolling or pressing it remains the same.

Some Difficulties Overcome

It will be useful in this paper to review some of the trouble we have met with in connection with other trades where tubing has been used to a great extent, and to mention some of the failures, as the same or similar faults may occur in aeroplane construction. When the Bowden brake was first used on cycles and motorcycles the practice followed was to drill the tube near the handle-bar lug to allow the cable to pass through, and this resulted in a large number of breakages. This difficulty was overcome by drilling the holes through the lugs; but many accidents occurred before this practice was adopted. Under an alternating stress a tube which has been drilled, unless properly reinforced, is very likely to fail. A series of running tests on drilled and undrilled tubes has shown that when stressed up to near its elastic limit the undrilled tubes has in many cases 10 to 20 times the life of the drilled tube. It is often the case that the harder the tube the greater the risk of breakage through a hole. One way of breaking a hard-drawn tube, adopted in tube mills, is either to "nick" the tube on one side with a file or to punch a hole in one side and then break by striking the tube on a block or anvil.

Quite recently we have carried out a large number of important tests on a special type of alternating stress testing machine which we had built. This machine, together with many of the tests carried out and the results achieved, was to a great extent due to the enthusiasm and foresight of Lieutenant-Commander H. N. Wylie, R. N. V. R., and Lieutenant R. W. Fieldwick, the resident A. I. D. Inspector at our works, and to whom we wish to express our thanks for help given.

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*Paper read before the Aeronautical Society on May 2, 1918

Various results of tests carried out on the machine referred to will be given during the course of this paper.

Badly Designed Cycle Lugs

Another series of failures was caused by unsuitable lugs. Some of those used in the earlier days of motorcycling had very strong outlets, and case after case of tube failure occurred. The tubing sometimes broke off so cleanly as to give the appearance of having been cut through. The broken tubing could be flattened, thus proving it was ductile and in a proper condition for its purpose. In order to prove that the fault lay in the excessive strength of the lugs, a series of experiments was carried out a number of years ago. A lug, as generally used, was tapered off at one outlet and left strong at the other. A piece of tubing of the usual gauge and quality was brazed into the lug and the lug firmly secured to a plate. The ends of the two tubes were then moved by eccentrics and connecting rods giving a ½ in. movement at a speed of about .400 alternations per minute. Each time the experiment was tried the tube broke off cleanly close to the thick outlet, whereas the tube at the tapered outlet remained intact.

Another interesting test was as follows: After brazing the tube into a lug with respectively thick and tapered outlets similar weights were applied to the ends. The tube in the tapered outlet bent with an easy curve, but that at the other end bent abruptly close to the thick outlet.

Front Forks for Cycles

It has been proved to the satisfaction of many cycle and motorcycle engineers that to keep on merely increasing the gauge of a tube that appears to be too weak for its work is not always good practice. For instance, take the case of the front fork tube as used on the ordinary cycle. This tube has proved of ample strength for use on the excellent highways of this country, but for Continental roads something better was wanted. Some years ago we supplied a large quantity of front forks produced from 19-gauge tubes to Russian cycle manufacturers. We were asked to increase the thickness to 18-gauge, on account of a number of breakages occurring. We did so, but matters were not improved, and we were then requested to increase further to 17-gauge. There was still no improvement; indeed, the number of breakages increased. The forks all broke off where they were brazed into the crown, and we were asked by the Russian manufacturers to help them out of their trouble. One way of doing this would have been by using a suitable liner or sleeve, but we tried another method, which proved quite successful. We brought brack the gauge of the tubes to 19 where brazed into the crowns and tapered the gauge to 22 at the bottom ends. This proved effective; a lighter article by about 40 per cent., from the same quality steel, thus standing the strain successfully. This result is accounted for by the fact that the shock was more equally distributed along the tubing, due to the strength being reduced gradually, away from the brazed portion, whereas in the plain gauge tubing the whole of the movement was concentrated in a very small space near the crowns.

Tapered Tubes

Tapered tubes could, in our opinion, be used in aeroplane construction to a much greater extent than at present, especially as struts or spars.

Alternating tests as follows were carried out at 400 revolutions per minute on 1-in. by 20-gauge steel tubing, using two parallel lengths and two pieces tapered ½ in. per foot. A weight of 111.56 lbs. was suspended on each tube at a distance of 12¾ ins. from the grips, giving 25 tons stress. The plain pieces broke after 20,585 and 30,390 revolutions respectively, as against 23,557 and 38,225 revolutions respectively by the tapered pieces. The weight of the plain tubes was 6¾ ozs. each and that of the tapered tubes 6¼ ozs. each. In both cases the break on the plain tubes was straighter than on the tapered one.

There are several ways in which to taper a tube. A method much in use is that of swaging, but this is a most unsatisfactory way, as the tube is not kept round whilst being reduced. Swaging tools cannot be quite circular, as a certain amount of "backing off" must be given to them, or the tube will be pinched and crumpled. The continued deforming of the tube during this operation causes it to split if it is much reduced, and the steel is left brittle. Tapering is more successful if done on rolls, as it is then possible to keep the tube round, and the steel is left in a much better condition. In reducing the tube by tapering it is thickened in gauge roughly by about two gauges in a reduction of 50 per cent. of its diameter. A tube of 1⅛ in. by 20-gauge would thicken to 18-gauge if tapered down to 9/16 in. diameter. If uniformity of gauge be aimed at it would be necessary to thin the tubing before the tapering operation. This can be done by drawing. It is even possible to make a tube tapering both in diameter and thickness if such is required.

Tubular Liners or Reinforcements

Considerable attention has been given to the matter of liners as reinforcements to tubes. In cases of trapped or flattened ends of struts a piece of strip steel is often inserted and soldered or riveted into position. This is not good practice, as the tube is not strengthened beyond the point at which it is flattened, and it is well known that, without some additional strengthening, a tube is always weakest at the point where the change of shape begins. If, before flattening, a tubular liner of a gauge equal to about half the thickness of the piece of strip steel is inserted to extend some distance beyond the trapped portion, a much better result is obtained. Various compression tests have been carried out from time to time, and the tubular liner has always proved to be superior.

A liner, however, to be really efficient, should be brazed or soldered to the tube. A series of alternating stress tests has proved to this point. Many liners used in tubular constructional work are not fixed, and consequently do not prevent the tube breaking, but may be sufficient to avoid accidents resulting from such breakages. Take, for instance, a front fork tube on a motorcycle. The liner, often a long one, is put in because this tube has frequently failed at the lugs and serious accidents have occurred, but the position of the liner in the fork makes it very difficult to solder or braze in its place. However, if a fork tube should break the liner will save the situation.

It is not wise to make a liner stronger than the tube it is to reinforce unless the ends of the liner are tapered off gradually or weakened by serrations. When the ends are serrated and the liner is not brazed or soldered into the tube this serrated portion is seldom of any value, as it quickly takes a "set" away from the tube when it has been subjected to a bending stress.

Perhaps the better way to reinforce tubular parts is by means of strengthening "sleeves" brazed or soldered to the outside of the tube. Although in appearance not so neat as when an internal liner is used there is the certainty of being able properly to fix the sleeve in position. A drilled tube 1 in. by 20-gauge was reinforced by a sleeve (in halves) 2½ ins. long by 18-gauge thick, pressed into position over the hole. This tube was subjected to an alternating stress test at 400 revolutions per minute. The sleeve expanded at the ends under the test and gradually became so "bell-mouthed" as to be of little practical use. The tube fractured across the hole at 9,320 revolutions.

Another tube was cut from the same length, similar in all respects, but it had the sleeve soldered in position. This tube did not break until after 43,867 revolutions had been made, and then it failed between the sleeve and the grips.

Another piece of tubing, also from the same length, having a plain hole drilled through and not reinforced at all, failed across the hole after 3,684 revolutions.

The following is a tabulation of the results just described:

Sleeve pressed on only....	9,320 revs.
Sleeve soldered on........	43,867 "
Without sleeve	3,684 "

These tests point to the fact that sleeve merely pressed into position his little value, but that when fixed to the tube by soldering or similar means it acts as an efficient reinforcement.

A number of tests were carried out at the time on laminated tubes, formed by drawing one light tube over another, to take the place of a tube of the same weight as the two combined. Under the few tests made the laminated tubes withstood vibration and shock much beter than the plain heavy-gauge tube. The only reason we can assign for this is that cold drawing hardens the outside of the walls of the tube more than the center if the tube is a thick one, and by drawing together the two thin tubes to give the same thickness of wall the metal has the benefit of the double drawing operation. Further tests are necessary to prove or disprove this point.

Tube Manipulation

The possibilities of tube manipulation such as butting, tapering, drawing with taper gauge, expanding, flanging, bending, lapping, etc., are becoming better understood. Some designers, however, whilst recognizing the usefulness of these different operations, still ask for what is not commercially possible, because they fail to make allowances for the alteration in the thickness of the tube which will occur as the result of such operations. For instance, if the diameter of a tube is increased the thickness of the wall is reduced, and if decreased in diameter the thickness is increased. Again, if a tube is flanged, the flange will not be of uniform gauge, but will decrease in thickness as it increases in diameter.

A section of a bent tube cut from F2.B undercarriage "V" strut was then shown. The gauge of the tube had by bending been reduced on the outside of the curve from .061 in. to .048 in., and increased on the inside from .061 in. to .072 in. The thinning of the tube would cause it to break if it had not been properly annealed; and, further, if proper mandrels had not been used, or the tubes had not been filled with suitable material, a series of "puckers" or "corrugations" would have ben formed on the inside of the bend. Where proper thickening up of the wall along the inner curve takes place in bending the bent portion of the tube is the strongest, but if "puckering" takes place this point becomes the weakest.

Bending is sometimes carried out on steel tubes whilst in the hot state, but where strength is required this is bad practice, as by heating the tube is rendered much weaker than it would be if bent in the cold state.

Official Specifications for Army Aeroplane Lubricant

(Concluded from page 723)

Manufacturers' Approved List

14. The manufacturer shall submit, free of charge, a one-gallon sample of the oil made up in accordance with this specification. Oils which meet the physical and chemical requirements of this specification will be placed on a tentative approved list. The buyer will then order ten barrels of the oil, which will be tested out under actual flying conditions. The oils which successfully pass this service test will be placed on an approved list and may be sold by the manufacturer as his brand of Liberty Aero Oil.

Inspection, Sampling and Shipment

15. The manufacturer shall arrange for the inspection, sampling, testing and shipment of the oil in accordance with detailed instruments to be furnished by the buyer.

Packing and Marking

16. The buyer may require that the oil shall be furnished in wooden barrels or steel drums containing approximately 50 U. S. standard gallons, or in tin containers holding not less than 5 U. S. standard gallons packed two to a case.

17. Tin containers shall be provided with a screw cap not less than 1¼ inches in diameter located in one corner of the top, and with a screw cap vent not less than ¼ inch in diameter located in the opposite corner of the top.

18. Barrels, drums, tin containers and cases shall be plainly marked with the name of the manufacturer, the kind of oil, order number and such other information as the buyer may direct.

Prices

19. Bidders must submit prices on oil in bulk with an additional statement as to the prices of other containers.

The Austrian Berg

(Concluded from page 720)

in by a deep engine housing. It is mounted on two spruce bearers, each made up of three laminations, mounted on four transverse partitions. These are made up of a spruce centre with facings of three-ply. The armament appears to have been made up of two machine guns, one on each side of the engine, and fitted with the usual interrupter gear.

The wings, which are both of equal span, present nothing out of the ordinary as regards their construction, except that some of the fittings for the internal wire bracing and compression tubes are exceptionally neat in conception and well carried out. Aerodynamically, however, the wings present an interesting feature. The upper surface of the wing section has a most decided return sweep, beginning behind the rear spar and being of such a magnitude as to present a considerable area of concave surface.

The undercarriage of the Berg is not in place on the machine as exhibited, but from fragments it is judged to have been of the Vee type, and in the accompanying illustration we have endeavored to reconstruct it approximately as various considerations indicate that it must have been.

The tail planes are built of steel tubing throughout, and the fixed tail plane is chiefly remarkable on account of the fact that, although it is built up of single steel tubes, the section is made cambered by bending the single tubes forming the ribs. Both upper and lower surfaces, therefore, have the same camber. The incidence of the tail plane is adjustable, but not during flight.

Later, as opportunity occurs, we hope to be able to publish some illustrations of the more important constructional details of the Austrian Berg fighter.

ACROBATIC FLYING

By LIEUT. CHARLES W. KEENE

THERE is nothing which increases a student's confidence and flying ability like "stunt" or acrobatic flying. It also arouses their enthusiasm and creates rivalry, which is very desirable. There is nothing hard or dangerous about it and any one who has had 20 hours or more solo can master all the stunts I shall describe in one hour with a good instructor, and should then be sent up to do them alone.

In my experience I do not know of a single fatal accident caused from stunting when the pilot had received instruction, but I know of lots of them that could have been avoided had the pilot been at ease when his plane was in awkward positions.

Although I have been flying, off and on, since 1911 I never had full confidence in the air until I learned to do my first tailspin last summer.

Loops

Hold machine down about 20° for a few seconds to get speed.

Pull stick back slowly at first, and faster as plane goes further into loop.

There is less resistence to pull as top of loop is reached, so that a steady pull will bring the stick back at about the right speed.

Stick is all the way back just before top of the loop is reached, No. 2, and is kept in that position until position 3 is reached, when it is pushed slowly forward and reaches neutral, just as the nose of plane comes up to horizon, and the machine is then in normal flying position.

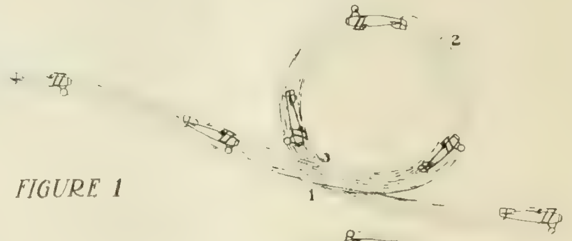


FIGURE 1

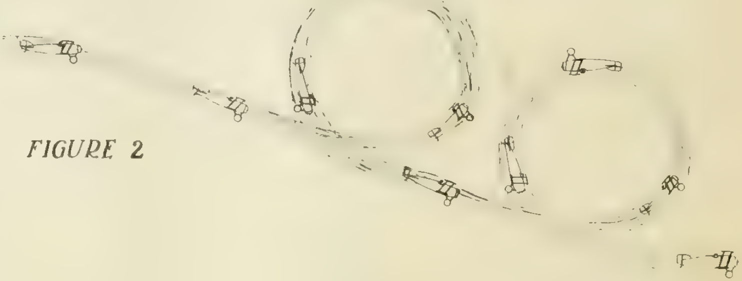


FIGURE 2

This method of making a loop prevents coming out with excessive speed.

The pressure on the elevators tend to pull stick forward at about the right time.

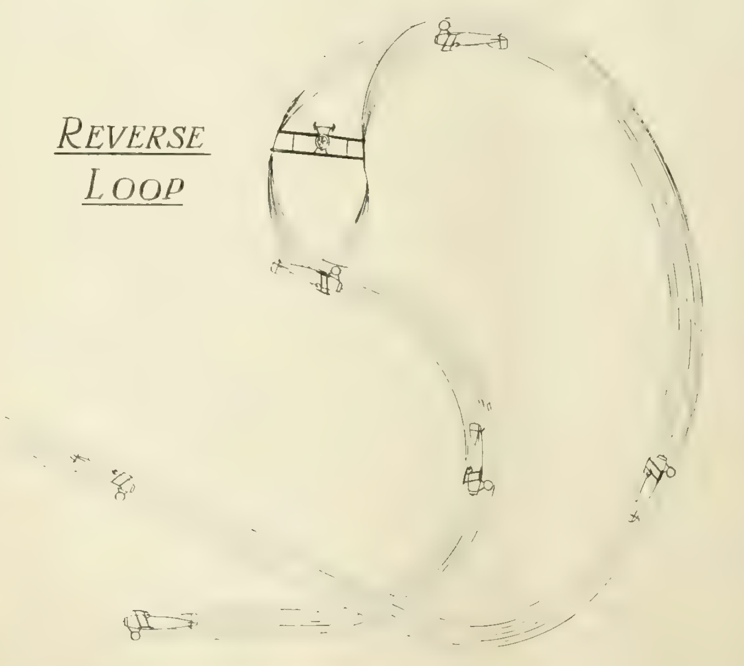
Loops should be fast enough to prevent motor cutting out on top.

There is less strain on plane in fast loop, as the pressure is not reversed on planes as when it stalls on top or falls on over.

When a series of loops are made the stick is pushed forward on coming out of first one in time to stop nose of plane about 20° below horizon, as in Fig. 2, and held in that position until sufficient speed is attained.

It is better to go down at a small angle to get speed, as the motor works better than it does at a steep angle and there is less strain on machine and less distance to go before top of loop is reached.

Loops should always be made when going into the wind.



REVERSE LOOP

Tailspins

There are several different ways of getting into a tailspin, but all of them result from a stall.

The easiest and simplest way is to cut the motor, pull the stick all the way back and push the rudder all the way in the direction desired to spin.

Another way is to climb vertically with motor on until stalled, then give rudder and keep stick back. The plane will fall to side on which rudder is used and go into a flat spin with lots of whip in it. The motor will cut out at the top of the stall, but will start again about the time the spin begins.

Although a spin can be made and taken out with the motor on there is danger of breaking or straining the plane and it is better policy to throttle down.

The way to come out of spin usually taught is to push stick forward to neutral position and give opposite rudder until spins stops. The ship is then in a nose dive and can easily be taken out by pulling back on stick. This method will do the work but one loses a lot of altitude and comes out with excessive speed. A better way is to keep control lever back all the way and give opposite rudder. The machine will stop spinning and level out at the same time and without getting up dangerous speed or losing much altitude. Care should be taken to put stick in neutral as soon as the plane is in a level position or it will go into another spin in the opposite direction.

After the first few turns the speed downward does not increase materially and it is safe to spin any distance.

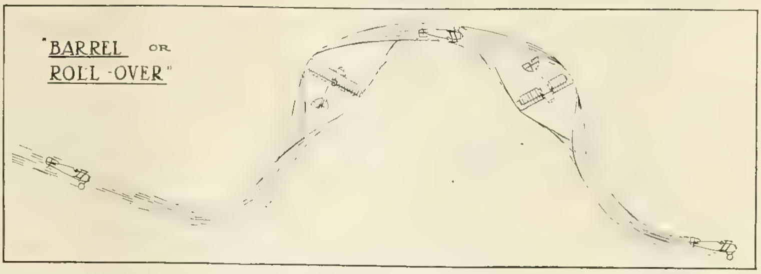
The pilot in the back seat is seldom killed when a plane falls to the ground in a tailspin.

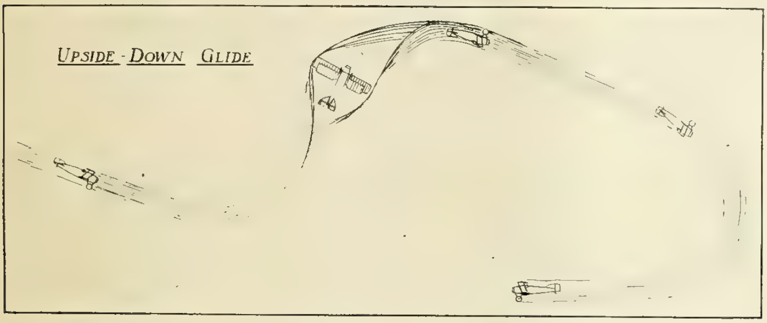
Immelman Turn

Dive down on a 20° slant to gain speed.

Pull back stick and climb at about 60° angle.

Kick rudder sharply in the direction desired to turn. This will turn plane over on back. Reverse rudder to stop plane in this position, then back to neutral.





Keep stick back until plane comes down and back to level position.

No aileron used.

Start cross wind and turn away from wind to get best results.

Barrel or Roll-over

Start similiar to Immelman Turn but with more speed.

Instead of reversing rudder when upside down, keep a little rudder on and some aileron and stick pushed forward.

Plane will go into side slip and complete turn.

Upside Down Glide

Start same as Immelman Turn when on back cut motor and push stick all the way forward, rudder in neutral.

Machine will glide on back. To come out pull stick back until around in level flying position.

This may also be done from top of loop in same manner.

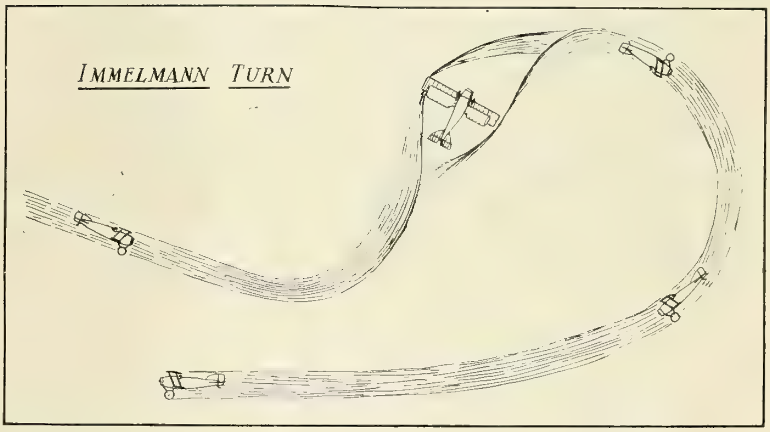
It will be more successful however if loop is made with wind instead of against it so that glide will be against wind.

Reverse Loop

(This is my name for this trick as I learned it myself, however, I think there is another name for it.)

Start same as loop.

When on top, cut motor, push stick forward, and kick rudder sharply. Plane will begin to fall and spin slowly around still on back, when half a turn is made put rudder in neutral and pull back stick coming out in opposite direction.



A Thought for All of Those Flyers of Yesterday

By Capt. Leon Richardson

WRIGHT, Hoxie, Beachy, Johnstone, Badger, Christofferson, Carlstrom, Brindley, and many of our noble, courageous pioneers of the air, both living and dead.

Long live the memory of their achievements, promoting, encouraging, and developing that one great dream of man, materializing that dream into a reality until finally mastering the air by mechanical flight.

The world's greatest enemy across the seas, realizing the great importance aircraft would play in their warring for supremacy on earth, developed this science more so, than perhaps any other nation at the time, and through the tenacles of this German Octupus, caused the various woods and materials required in the building of aeroplanes to be cut, and manufactured and shipped to Germany and in many other manners tied up the various essentials, to that extent, that other nations felt the steps taken by them, when they were caused to build large fleets of aeroplanes for themselves and to question the supremacy of the air with the German.

Thanks to Mother Nature in vesting the territorial bounds of the United States with the vast growths of Pine, Spruce, Ash and Walnut, wood so essential in aeroplanes, and with mineral and brains to supply other allied nations as well as ourselves with these valued treasures, and to have finally wrested from the "Hun" his laurels as Masters of the Air.

Wood and mineral alone did not solve the problem but only serves as factors. Motors, linen, engineers and skilled workmen all play most important parts, each separate units of themselves—co-operating and co-ordinating until the finished aeroplane product, the performance of the Aeroplane in the air, has been the proof of their efforts.

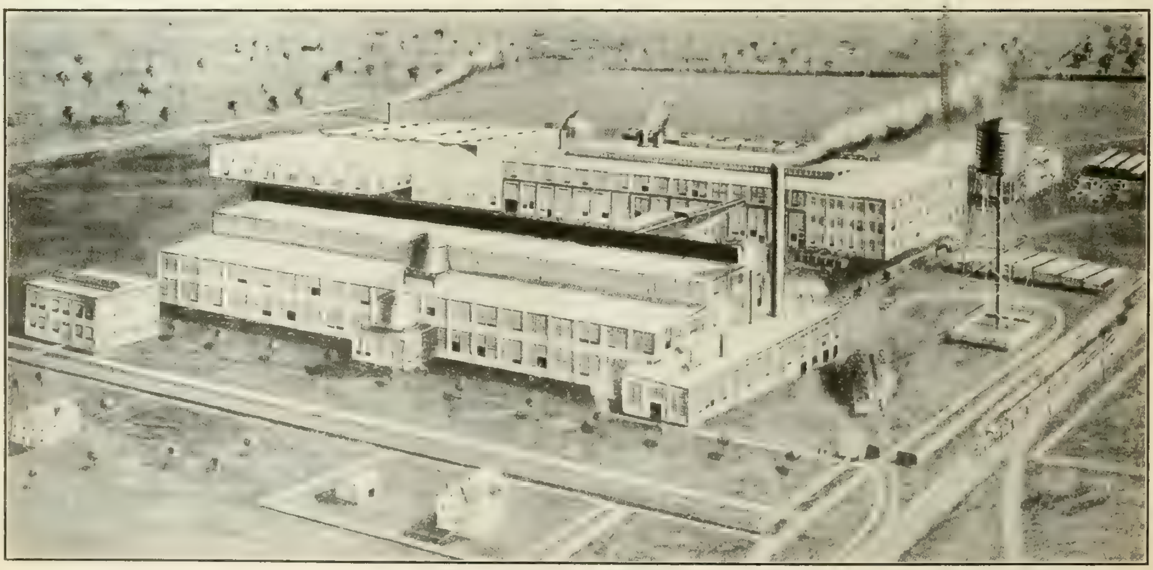
All these factors which now have produced the War Winning Arm or machine cannot be grouped to then equal the efforts of our now deceased fellow man who gave his all in the advancement of this one science which has and will mean so much more to the world than any other one or individual mehcanical means so far invented and harnessed by the brain and braun of man.

Let us offer silent tribute and prayer to our fallen brethren, let their deeds, memory, and progress, not be forgotten in the humm dumm of battle and advancement of newer designs and achievements, which might cause our pioneer progress, achievements, and advancement and their memory to be forgotten. Therefore a prayer, tribute and thought for our pioneer flyers.

Lawson

AIRCRAFT

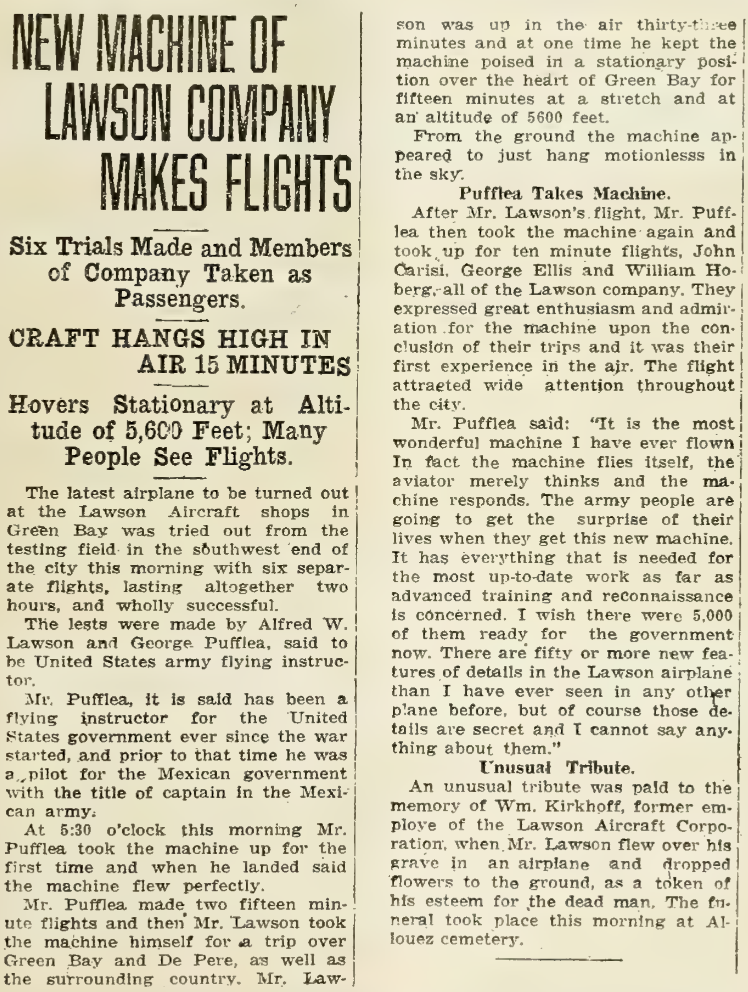
THE PRODUCT



THE PLANT

From Green Bay Press-Gazette

May 2nd, 1918



NEW MACHINE OF LAWSON COMPANY MAKES FLIGHTS

Six Trials Made and Members of Company Taken as Passengers.

CRAFT HANGS HIGH IN AIR 15 MINUTES

Hovers Stationary at Altitude of 5,600 Feet; Many People See Flights.

The latest airplane to be turned out at the Lawson Aircraft shops in Green Bay was tried out from the testing field in the southwest end of the city this morning with six separate flights, lasting altogether two hours, and wholly successful.

The lests were made by Alfred W. Lawson and George Pufflea, said to be United States army flying instructor.

Mr. Pufflea, it is said has been a flying instructor for the United States government ever since the war started, and prior to that time he was a pilot for the Mexican government with the title of captain in the Mexican army.

At 5:30 o'clock this morning Mr. Pufflea took the machine up for the first time and when he landed said the machine flew perfectly.

Mr. Pufflea made two fifteen minute flights and then Mr. Lawson took the machine himself for a trip over Green Bay and De Pere, as well as the surrounding country. Mr. Lawson was up in the air thirty-three minutes and at one time he kept the machine poised in a stationary position over the heart of Green Bay for fifteen minutes at a stretch and at an altitude of 5600 feet.

From the ground the machine appeared to just hang motionlesss in the sky.

Pufflea Takes Machine.

After Mr. Lawson's flight, Mr. Pufflea then took the machine again and took up for ten minute flights, John Carisi, George Ellis and William Hoberg, all of the Lawson company. They expressed great enthusiasm and admiration for the machine upon the conclusion of their trips and it was their first experience in the air. The flight attracted wide attention throughout the city.

Mr. Pufflea said: "It is the most wonderful machine I have ever flown In fact the machine flies itself, the aviator merely thinks and the machine responds. The army people are going to get the surprise of their lives when they get this new machine. It has everything that is needed for the most up-to-date work as far as advanced training and reconnaissance is concerned. I wish there were 5,000 of them ready for the government now. There are fifty or more new features of details in the Lawson airplane than I have ever seen in any other plane before, but of course those details are secret and I cannot say anything about them."

Unusual Tribute.

An unusual tribute was paid to the memory of Wm. Kirkhoff, former employe of the Lawson Aircraft Corporation, when Mr. Lawson flew over his grave in an airplane and dropped flowers to the ground, as a token of his esteem for the dead man. The funeral took place this morning at Allouez cemetery.

THE PERFORMANCE

LAWSON,
GREEN BAY, WIS.

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Spruce Division, Yeon Bldg., Portland, Ore.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 2.—Report to Director of Aircraft Production, Washington, D. C.

Note 3.—Report to the President, Aviation Examining Board.

Note 4.—Report to District Manager of Equipment Signal Corps, Curtiss Aeroplane Corp., North Elmwood Plant, etc., Wire Director of Aircraft Production.

Note 5.—Report to Camp Alfred Vail, Little Silver, N. J.

Note 6.—Report at Madison Barracks, Sacketts Harbor, N. Y.

Note 7.—Assume command at Aviation General supply depot, Chicago, Ill. Wire Director of Aircraft Production.

Note 8.—Report to District Manager of Equipment, 480 Lexington Ave., New York.

Note 9.—Report to 130th Sqdn., Pratt Institute, Brooklyn, N. Y.

Note 10.—Report to Signal General Supply Depot, Fort Wood, New York Harbor.

Note 11.—Report to C. O. Fairfield, Ohio.

Note 12.—Report to Fort Wayne, Mich.

Note 13.—Report to Austin, Texas, School of Radio Operators.

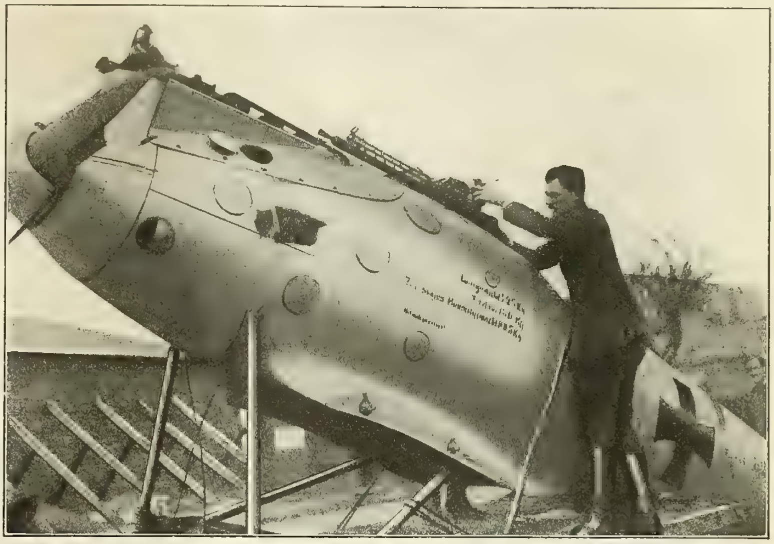
Special Orders Nos. 125-129, inclusive

A

Austin, Calvin E.	DIK
Andrews, William Y.	Note 7
Annan, Duncan	DIK
Atkins, Charles Miner, 3d	SLR; RWT
Azzopardi, Alessio	FLR
Avent, Ira M.	FRF
Ames, Theodore Gordon	SLR
Anderson, Harold	SLR
Archer, Cecil Elmore	SLR
Abbott, Edwin I.	FRF
Ames, Willey M.	FRF
Ames, Shirley L.	FLR; VBW
Anderson, Milton Stanton	SLR
Allard, John, Steton, Jr.	SLR
Anderson, Edwin Ferdinand	SLR; DIK
Adams, James Seybold	SLR; DIK
Aldridge, William Southworth	SLR
Aven, William Ralph, Jr.	SLR
Adams, James D.	TFT
Atkins, Henry C.	TFT
Avera, John W.	CWT
Anderson, Richard M.	EOT
Appelman, Earl	DIK
Ackley, Samuel Fowden	SLR; VBW
Abineau, Marion J.	PFO
Allen, Richard C.	PWM
Allan, Roy F.	LHV
Ammel, Roy William	SLR; LDT
Aubuchon, Joseph M.	LDT
Aleshouckas, Joseph W.	LHV
Arnold, Henry R.	PWM
Allen, Leonard S.	SMM
Allen, Albert A.	FRF
Alvord, Lincoln	FRF
Alexander, Robert Plunkett	SLR; KST
Apple, Addison A.	SLR; KST
Adams, Stanley B.	DIK
Adams, Henry Perry	FLR; Note 11
Allard, John S.	DIK
Aven, William R., Jr.	DIK
Axley, Seth	FRF
Aldridge, William S.	DIK

B

Barksdale, Julian Neal, Jr.	SLR; KST
Brainerd, Madison Edward	SLR; CSO
Butler, Morgan	FLR
Barr, Lester Stewart	SLR; AAD
Behel, Vernon Wilbur, Jr.	SLR; KST
Barnhill, William A.	FRF
Brown, Harrey Leonard	FLR; CSO
Bullard, Edward Lauriston	SLR; CWT
Brokaw, John A.	DIK
Barrett, Vinton E.	DIK
Brant, Gerald C.	REL; KST
Berglund, Eugene Nicholaus	SLR; AAD
Boutwell, Louis E.	FRF
Barnes, Jean Carlisle	FLR
Baker, Robert Horace	SLR; AAD
Beiersdorf, Frederick William	SLR; RWT
Batts, Carl T.	FRF
Barnes, Dwight F.	FRF
Balbach, Nyle J.	FRF
Babcock, Harry Allan	SLR; RWT



A recent German victim, brought down by one of our Squadrons. The constructional details are of interest

Brewster, Morell K.	FRF
Brandenburger, Walter O.	FRF
Boucher, Clarence K.	FRF
Blackburn, Jack	SLR; GLC
Beaton, Harold W.	FRF
Buchtenkirch, George C.	WAC
Brennan, James T.	FRF
Bonesteel, J. William Kenneth	SLR
Boxell, Earl Francis	SLR
Breckon, Leslie Stewart	SLR
Bruch, Louis Mason	FRF; SLR; DIK
Behr, Kenneth Paul	FRF; SLR; AAD
Bowen, Lewis Love	SLR
Barnes, Robert Henry	SLR
Buser, Albert Ervin	SLR
Bacon, Oliver Greene	SLR; BST
Blain, John Dean	SLR
Baker, Harry Sargent	SLR
Baker, Harold Henry	SLR
Beck, Daniel H.	SLR; DIK
Benton, John William	SLR
Boyd, George Winn	SLR; DIK
Bralley, Ernest Meade	SLR
Brewer, Percy Osborne	SLR
Brown, Harold Leslie	SLR
Brown, Henry James	SLR
Brown, Kenneth Parker	SLR
Brunner, Charles Felician	SLR
Burdick, Lorence Bushnell	SLR; DIK
Burns, George Robert	SLR
Barnard, Albert	SLR
Bartholomae, William August	SLR
Baum, Frank Hutchins	SLR
Bockus, Harry Nelson	SLR; DIK
Boothe, William Henry, Jr.	SLR
Borden, Joseph Louis	SLR
Bisgood, Frederick Whitaker	SLR; DIK
Burroughs, William McCaffrey	SLR; EOT
Bell, Robert Wendell	SLR; RSD
Brown, David K.	SLR; AAD
Burns, LeRoy Wilson	SLR; AAD
Butler, Roy J.	SLR; RSD
Butts, Daniel Edward	SLR; AAD
Barber, Thomas L.	KST
Burgess, George H.	EOT
Begni, Tito	WAC
Blount, Frederick Ripley, Jr.	SLR; RWT
Bader, Eugene Francis	SLR; AAD
Bond, Wilmer Krusen	SLR; CWT
Berger, Earl Osborne	SLR; KST
Bruce, Parker	SLR; LDT
Barrett, William Joseph	SLR; RSD
Baughan, Stephen Decatur Large	SLR; RWT
Baukat, James George	SLR; EOT
Bausher, John G.	TFT
Braun, Bruce E.	TFT
Buck, Edward H.	TFT
Bruch, Russell L.	CWT
Bolz, Adolph Charles	SLR; KST
Bogel, Galitzin Newton	SLR; KST
Belsky, Charles James	SLR; RSD
Barrett, James R.	LDT
Brodrick, William J. H.	LDT
Baker, John F.	Note 3
Bramlette, James Lee	SLR; LDT
Brown, Edward Aprhys	SLR; EOT
Booth, Harold Wilds	SLR; RWT
Blanchard, George K.	PWM
Bender, Ned Joseph	SLR; KST
Burr; Walter Andrew	SLR; KST
Bertaud, Lloyd W.	TMA
Bruner, Donald L.	DIK
Brothers, William F.	TFT
Blandford, James T.	TMA
Burns, Ruel F.	TMA
Bidwell, Robinson E.	LDT
Brants, Harry E.	CWT
Butterfield, Harold H.	EOT
Boulware, George H.	LHV
Bibb, John T., Jr.	PWM
Brewer, Kenneth E.	PWM
Batson, Shelby H.	TFT
Bates, John H.	CWT
Black, Robert O.	EOT
Barrett, William J.	LHV
Bracken, Joseph E.	PWM
Barnes, Kenneth G.	EOT
Bailey, James R.	LDT
Bissel, Paul L., Jr.	PFO
Blackman, Clifford L.	PFO
Burge, Kemp Stucky	SLR; KST
Beresford, Paul C.	FRF
Bagley, James K.	FRF
Baxter, Robert Knighton	SLR; KST
Baird, Chester A.	EOT
Benjamin, Everett F.	EOT
Bracket, Joseph T.	EOT
Bogan, Paul A.	FRF
Bradley, Leslie K.	DIK
Baxley, James H.	EOT
Blook, Harold C.	EOT
Bryant, Marquis V.	Note 13
Bullitt, Joshua Fry	SLR; CWT
Braun, William Parker	SLR; LDT
Blan, Ollie Lionel	SLR; KST
Bowman, Charles E.	DIK
Burns, John L.	FRF

C

Coombs, Cyril Leslie	SLR; RSD
Crawford, Reed Fitzwilliam	SLR; RSD
Creighton, Andrew Donelson	SLR; ELA
Curry, William	SLR; GLC
Cutler, Harvey Donald	SLR
Calkins, Reginald Jackson	SLR
Carpenter, Kenneth	SLR
Caldwell, Frederick Wyllys	SLR
Carroll, Alonzo Marcellus, Jr.	SLR
Codington, Arthur David	SLR
Condron, George Tolman	SLR
Collier, Ralph Phelps	SLR
Creswell, Paul H.	SLR
Croen, Herman F.	SLR; KST
Carter, John Owen	SLR
Crook, Wilson Walter	SLR; DIK
Crawford, Noble Russell	SLR; DIK
Cleveland, Chester Emery, Jr.	SLR; BST
Clark, Dunlap Cameron	SLR
Croom, Marvin Earl	SLR; DIK
Cooper, Edwin Jonas	SLR
Cook, William Lamphere Sturgis	SLR; PMT; FRF
Chaffee, Herbert Norton	SLR; RSD; FRF
Carroll, Alonzo M.	BST
Campbell, Archie H.	FRF

A Caudron training machine. Note the landing gear, which is constructed to withstand the hardest shocks. French Official Photo.

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Some monoplanes at an American Aviation Field in France

Conway, Cornelius M	FRF
Corkan, Dudley C.	FRF
Clauss, Albert F.	FRF
Carryl, Frank M.	FRF
Curry, John F.	DMA
Cartwright, Paul	SLR
Caldwell, Edward Fred	SLR; DIK
Chamberlain, Leo Wesley	SLR
Clark, Earland Floyd	SLR
Collier, Trezevant	SLR
Colliver, Harry Forrest	SLR
Colton, Earl Glenn	SLR; DIK
Conlogue, John Augustine	SLR; DIK
Conrad, Carl Cecil	SLR
Cook, Ray Charles	SLR
Corbitt, Marsh Morgan	SLR
Costar, Lloyd	SLR
Cotton, John Bowman	SLR
Croxson, Albert Milne	SLR; DIK
Cummings, Charles Milton	SLR; DIK
Cantey, Samuel McGowan	SLR; DIK
Carroll, Earl	SLR
Chapman, William Burr	SLR
Collins, William Frederick	SLR
Corbet, Clinton Litchfield	SLR; DIK
Cook, Seth W.	DMA; EOT; Note 1
Cheney, Moses E.	Note 8
Chaffee, Raymond O.	DIK
Corsaut, Jesse Harrison	SLR; CAF
Coffman, Lionel Alton	SLR; KST
Campbell, Dudley Rhodes	SLR; AAD
Cowan, Royal W. B.	TFT
Crowell, Elmer A.	TFT
Coward, Raymond S.	TFT
Conant, Rollis G.	TFT
Castle, Benjamin F.	RSD
Carlton, Henry F.	LHV
Clark, McKinley F.	LHV
Chadbourne, Reuben J.	PWM
Christie, Donald Cameron	SLR; CAF
Cull, Edwin Emory	SLR; CWT
Campbell, Robert Burns	SLR; EOT
Colliver, Harold Eugene	SLR; EOT
Charlton, Donald H.	FRF
Claude, Laurens	SLR; KST
Cochran, Thomas B.	TFT
Caldwell, Jabin B.	LDT
Cameron, David	LDT
Crafton, Jesse A.	SMM
Colvin, Arthur D.	PFO
Cavagnaro, James F.	LHV
Crawford, Frank H.	CWT
Craig, Thomas J.	SMM
Campbell, Walter M.	CWT
Curran, Cyril J.	TFT
Clauss, Albert F., Jr.	LDT
Cannon, George	TFT
Cline, Harold V.	LDT
Cleveland, Lyman W., Jr.	DIK
Carmine, John W. S.	LHV
Cox, Arthur S.	PWM
Carroll, Lee J.	EOT
Carlson, Carlyle R.	EOT
Callum, Preston D.	RTR
Crittenden, William Robert	SLR; EOT
Carson, Joseph A.	FRF
Coulter, Isaac H.	FRF
Cogswell, Harold	FRF
Cone, Charles Luther	SLR; KST
Cundiff, William I.	FRF
Cole, Robert Alfred	SLR; KST
Conroy, Thomas P.	FRF
Condron, George T.	DIK
Carpenter, Kenneth	FRF
Clark, Arthur T.	DIK; FRF
Crockett, Eugene W.	FRF
Chandler, William H., Jr.	Note 2
Caldwell, Joe H.	FRF
Carscadin, Henry L.	FRF
Conway, James V.	FRF
Crump, Don M.	FRF
Chase, Paul W.	FRF
Cauthen, James C.	FRF
Cotton, John B.	DIK
Culbertson, Craig	FRF

D

Doty, David E.	SLR; FRF; PMT
Davies, Walter Lawrence Jones	FLR; VBW
Dorian, Frank E.	FRF
Delano, Safford A.	FRF
DeShazo, Peter H.	LHV
Doering, Harold	FRF
Drexel, William R.	FRF
Dickey, Edward K.	FRF
Doyle, John C.	FRF
Doten, Max V.	FRF
Donovan, John C.	FRF
Daub, Wade Gordon	SLR
Dickson, Hunter Adam	SLR
Daniel, Roy Petery	SLR
De Lany, Russell Wetzel	SLR
Despain, Lawrence Newell	SLR
Dievendorff, Horton Harold	SLR
Douglas, Bernard Martin, Jr.	SLR
Dwyer, Martin James	SLR
Day, Curtis La Q.	SLR; EOT
Dewey, Robert Adelbert	SLR; AAD
Drake, Joseph Horace, Jr.	SLR; KST
Dake, Robert Edward	SLR; KST
Donovan, John Columbus	SLR; GLC
Doyle, William J.	FLR; VBW
Daniels, William Charles	SLR; EOT
Dalton, Wilfred	SLR; AAD
Dodds, Hiram E	TFT
Draper, Harold Dieckmann	SLR; KST
Davis, Edwin K.	LDT
De Hart, James	DIK
Darlington, Frank	DIK
De Courcy, William E.	DIK
Dunn, Walter V.	DIK
Duane, Richard B.	WFO
Degener, Paul Arnold	SLR; DIK
Davies, Stuart J.	PWM
Dowman, Charles H.	PWM
De Bettencourt, Manuel A.	EOT
Davis, Dalphin Alston	SLR; EOT
Dunn, Thomas F.	LHV
Doolittle, James H.	LDT
Dyche, Justin Kimber	SLR; KST
Dyer, Clarence A.	LHV
Dana, Dean	CWT
Donnelley, Clarence E.	CWT
Duncan, Asa N.	TFT
Dallas, Burnie R.	LDT
Dietrich, Richard H.	LDT
Davenport, William H.	Note 10
Dodds, Harry	SLR; KST
Duke, Jack E.	FRF
Denny, Cary F.	DIK; FRF
Davis, John Jay	FLR; Note 2
Dickey, Ralph Cooper	FLR; Note 8
Doering, Harold	SLR; CWT
Diggins, Ralph C.	FRF
Duke, Leslie B.	FRF
Davis, Earl A.	FRF
DesChamps, James W.	FRF

E

Edgerton, James C	HHN
Ebright, Carroll Malcolm	SLR
Ehrlichman, Ben Bernard	SLR; RSD
Elliot, Arthur Ernest	SLR; GLC
Ernest, Grant William	SLR
Ellery, Eugene, Jr.	SLR
Eustis, Edwin M.	FRF
Erikson, Erik A.	FRF; EOT
Eggleston, James D.	FRF
Elliott, Irl Joseph	SLR; AAD
Eddy, John Leslie	SLR
Elhart, Earl Walter	SLR
Emerson, Sumner Brooks	SLR
Everett, Aylett Lee	SLR
Ewing, Henry Gordon	SLR
Erlendson, Pjetur	SLR
Elston, Welcome Bridges	SLR; RSD
Eddy, Arthur Edwin	SMM
Erhardt, Ursinus Zachery	SLR; EOT
Ernst, Grant W.	SLR; AAD
Ellett, Alexander	SLR; EOT
Easterling, Anthony M.	DIK
Engh, Harold V.	PWM
Ebi, Kenneth A.	EOT
Ellis, Howard J.	EOT
Emmons, George B., Jr.	EOT
Elsey, George Wendell	SLR; KST
Emery, Amos Barton	SLR; EOT
Erickson, Harry A.	GLC
Edmund, Harvey W.	EOT

F

Fields, Frank Eugene	SLR
Fulwood, Charles Wesley, Jr.	SLR
Fry, John Oscar	SLR
Fairfield, Edward Murray	SLR; EOT
Frederick, Karl Andrew	SLR; ELA
Fulwiler, Howard D.	SLR
Falcon, Guilford Ward	SLR; EOT
Fleming, Hugh Bidlake	SLR; VBW
Fairbanks, William H.	MJR
Fieweger, Thomas E.	LHV
Friday, Ellsworth C.	FRF
Foster, William C.	SLR; AAD
Fox, Herbert F.	SLR; AAD
Ferry, Clinton S	FRF
Fowler, Lester Albert	SLR; RSD
Faust, Thomas Carlyle	SLR; RSD
Farnum, William Cushman	SLR
Farthing, Welbourne Owens	SLR
Faust, Leroy Henry	SLR
Fitzgerald, Harold Alvin	SLR
Frankley, Lawrence William	SLR
Frisbie, Hallet Burtrand	SLR
Fuller, Robert Nelson	SLR
French, Samuel Lorenzo	SLR; RWT
Fitzmaurice, William J.	REV; DMA
Flynn, Mortimer Gheens	SLR; LDT
Ferguson, George Francis	SLR; KST
Fabling, Harry Creed	SLR
Farris, Homer Virgil	SLR

American gunners operating an anti-aircraft gun. © Committee on Public Information

Fox, Herbert Franklin	SLR
Frost, John Austin	SLR
Fuller, Edward Reino	SLR
Frank, Norman Daniel	SLR; GLC
Fantham, Murry C.	TFT
Fort, Frank B.	TFT
Fowler, Louis Foote	SLR; LDT
Fleet, Reuben H.	EOT; BST; MAT; Note 1
Fuller, Leonard Beeman	SLR; EOT
Fulton, Richard Wallace	SLR; EOT
Frey, Frederick G.	DIS
Fieeze, Jackson L.	SMM
Fay, Samuel P.	TFT
Franklin, William E.	TFT
Fields, Curtis P.	DIK
Frandsen, Arthur S.	DIK
Frankfort, Frederick	SLR; KST
Fuller, Wiley Madison	DIK
Fauvre, Irving M.	FRF
Farrar, Delwin Bruce	SLR; EOT
Flachsenhar, Walter R.	MAC
Foster, Lee W.	DIK
Fulwood, Charles W., Jr.	DIK
Frick, Childs	DMA

G

Goree, Jonathan Daniel	SLR
Gheen, Raymond Fearson	SLR
Givens, James Douglas	SLR
Gerrett, John Williamson	SLR
Gay, Ernest Hubbard	SLR
Garrett, Joseph R.	FRF
Grieb, William C.	SMM
Gleerup, William Weston	SLR; EOT
Guttersen, Granville	SLR; EOT
Guidera, Albert M.	LHV
Geisler, Clement G.	FRF
Green, Lonsdale, Jr.	FRF
Gordon, Harold R.	FRF
Goodstein, David M.	FRF
Gowans, John	SLR; EOT
Goode, Henry Walton	SLR
Gunn, Roy Eugene	SLR
Gale, James Cloyd, Jr.	SLR
Gordon, James Beresford, Jr.	SLR
Grady, Harold Henderson	SLR
Giddings, Joseph Attwood	SLR; KST
Gilman, Harold Abrams	SLR; RWT
Goodsell, Ogden Maxwell	SLR
Geiger, William D.	FOB
Grant, Sidney B.	TFT
Gillett, Mellville	Note 7
Griggs, Milton W.	Note 4
Goldsmith, Reginald Max	SLR; KST
Goldthwaite, Joel A.	DIK
Glanz, Carl Christian	SLR; PMT
Garrett, Joseph Robert	SLR; PMT
Gormley, Richard Raymond	SLR; RWT
Gandy, Robert Lee	SLR; LDT
Goldie, William Bradshaw	SLR; RWT
Grimm, John Edward, Jr.	SLR; RSD
Graham, Arthur Sessums	SLR; KST
Gouverneur, Fairfax Heiskell	SLR; EOT
Gray, Will Klapp	SLR; KST
Glos, Walter Adam	SLR; AAD
Goldsborough, William C.	DIK
Gutzler, Raymond William	SLR; EOT
Gay, Ernest H.	DIK
Gilligan, Frederick M.	EOT

H

Hone, Charles Byron	SLR; EOT
Heffner, Paul	SLR
Henderson, Paul Raymond	SLR
Hooper, James Clinton	SLR
Helgesson, Henry Theodore	SLR
Henry, Percy Clancy, Jr.	SLR
Hellman, Richard Hoge	SLR
Hadley, Lawrence Burton	SLR
Hands, Stanley Moore	SLR
Ham, Mark Neely	SLR; EOT
Hitchcock, Francis B.	CUI
Hodge, Glenn Boyd	SLR; RSD
Hoggatt, Floyd Lionel	SLR; KST
Helmerich, Walter Hugo	SLR; DIK
Harrington, Herbert G.	FRF
Hicks, John	FRF
Heltzen, William Stanley	SLR; PMT
Harpel, Gates	SLR
Hodge, Clarence E.	FRF
Hendricks, Walter	SLR; CRI
Heine, Bernhardt Edward	SLR; CWT
Hiscock, Thorp	SLR; EOT
Huffman, Carl Fountain	SLR; EOT
Hill, Edward Hugh	SLR; EOT
Hofstetter, Carl Frederick	SLR; EOT
Hawks, Horace Gilmour	SLR
Hawkins, Ivan	SLR
Hayes, Perry	SLR
Heath, Edward Phillips	SLR;
Hodgkins, Pierce Nelson	SLR
Hoffman, Malvin Gerald	SLR
Hogue, Mark Campbell	SLR; DIK
Hopkins, Edward James	SLR
Hunt, Gilman Charles	SLR
Hunter, Archie Dean	SLR; DIK
Haddock, James Perry	SLR
Harding, Roy Edmond	SLR
Harpham, Edwin Lynn, Jr.	SLR
Henderson, Jacob Earl	SLR; DIK
Herrman, Gerald Francis	SLR
Hockett, Roland Redfield	SLR
Hotchkiss, Edward Gillette	SLR
Howard, Harold Harmon	SLR
Hoyt, Warner Fletcher	SLR
Hewitt, Robert Penrose	SLR; CWT
Halpin, John Henry	SLR; EOT
Hanson, Stanwood Lincoln	SLR; EOT
Hirshfield, Ira Wilson	SLR; EOT
Harvey, Harold Mellor	SLR; PMT
Hallem, Harry	SLR; CWT
Hoyt, Fred Day	SLR; RSD
Hollingsworth, Frank E.	TFT
Hamilton, Pierpont Morgan	SLR; AAD
Harper, Oliver Clifton	SLR; KST
Hogan, William A.	TFT
Hill, Armstead B., Jr.	TFT
Husted, Merle R.	TFT
Hyde, Gordon Eugene	SLR; PMT
Hamann, William Paul	SLR; HHN
Hawley, Herbert	SLR; EOT
Houston, Horace K.	DIK
Hoyt, Howard C.	DIK
Hillix, Albert Ficklin	SLR; RWT
Hardie, John Ford	SLR; LDT
Hand, Julius Mills	SLR; EOT
Hansen, James Henry	SLR; CRI
Heywood, Oliver Charles	SLR; KST
Howe, Lawrence L.	FRF
Hackedorn, Hillis Fee, Jr.	SLR; EOT
Hammond, Fred R.	DIK
Hardy, Richard L.	DIK
Harriman, Walter F.	DIK
Harris, Allan B.	DIK
Hendricks, George F.	DIK
Hostetler, Wilbur D.	DIK
Hyland, George N.	DIK
Houser, Percy Thomas	SLR; EOT
Hirshfield, Ira W.	CWT
Hooper, Arthur U.	PFO
Hill, Richard Junius	RTR
Hopkins, Ward Dean	SLR; LDT
Hangan, Alfred J.	DIK
Halsted, Harold C.	EOT
Hoffman, Jay F.	DIK
Healey, William R.	FRF
Hillman, Alfred D.	FRF
Hightower, G. B.	MAC
Harris, Carl A.	FRF
Hoadley, George, Jr.	SLR; FRF; PMT

I

Inlow, Walter Thomas	SLR
Isbill, Paul M.	LDT
Illett, Edward Wilson	SLR; EOT

J

Johnson, Everett Bailey	SLR
Jones, Clifford Earl	SLR; RSD
Jones, James D.	LHV
Jurdeh, Leonard Wells	SLR
Jaynes, John Belmont	SLR
James, Roy P.	FRF
Jacomini, Clement, Jr.	SLR: FRF
Jaggard, Robert Kenneth	SLR
Jaccard, William Nile	SLR
Jacquemart, Eugene Arthur	SLR: DIK
Jenkins, Nelson Durfee	SLR; GLC
Jones, Elmer Hugh	SLR; CAF
Johnson, Alfred Ridgely	SLR; Note 2
James, John R.	SLR; RSD
Jackson, Clyde H.	TFT
Jefferson, Theodore	TFT
Jannus, Roger W.	REV; DMA
Jackson, Paul C.	DIK
Jenks, Henry Irving	SLR; EOT
Johnson, Clare Thomas	SLR; EOT
Jack, Butler, Jr.	DIK
Jaenkle, William D.	DIK
Jordon, James J.	LDT

K

Knox, John Walter	SLR; AAD
Knox, Merton Hugh	SLR
Knight, Rixford	SLR; GLC
Kirby, Samuel Bonner, Jr.	SLR; DIK
Kuhn, Leo Warren	SLR; EOT
Kelly, Ralph Morse	SLR
Kramer, George E.	SLR
King, Harry C.	FRF
Keeler, John Fitzallan	SLR
Kennedy, Robert Emmett	SLR
Kievlan, Charles Edgar	SLR
Kinder, Roland Hugh	SLR
King, Alexander Mann	SLR
Knupp, Glenn Harold	SLR
Kohler, Carlos Chester	SLR
Kyle, William Forrest	SLR
Kier, Samuel Max	SLR
Kennedy, William Edward	SLR; DIK
Kratzer, Henry W.	DIK
Keeling, Walter Sherman	SLR; PMT
Kinney, Judson Stevens	SLR; RWT
Kelly, Oakley George	SLR; RSD
King, Alfred F.	DIK
Kiefner, Charles Edward	SLR; RWT
Kauffman, Carl Ruby	SLR; RWT
Kelly, Bernard Edmund	SLR; KST
Kolb, William M.	DIK
Kuntz, Frank E.	TFT
Kennedy, David S.	TFT
Kesl, Roy William	SLR; VBW
Kanitz, Edwin C.	DIK
Keil, Emil C.	DIK
Keyes, Nelson B., Jr.	DIK
Kingsley, Charles	DIK
Kilbane, James Anthony	SLR; KST
Kornrumpf, William L.	DIS
Keller, Frederick W.	DIK
Kirkendall, Freeman B.	DIK
Kinnear, Thoburn W.	SMM
Kennedy, Carl Francis	SLR; CRI; FRF
Kent, Thomas Thatcher	SLR; KST
Kirk, John B.	FRF

L

Littlefield, Robert Clement	SLR
La Fon, Alphonse	LHV
Lundgren, Theodore Sophus	SLR; RWT
Lile, Richard Leon	SLR; DIK
Loder, James Augustus	SLR
Lowell, George Clough	SLR
Lynch, Frederick Dan	SLR
Larson, Westside T.	SLR; FRF; PMT
Laing, Joseph A.	LHV
Leferink, Richard	DIK
Lang, William J.	WAC
Lienhard, John H.	FRF
Laubenfels, Clarence Rudolph	SLR
Lawson, William Eric	SLR
Leonard, Cecil Ebenezer	SLR
Lindsley, Dan Leslie	SLR; DIK
Lowenstein, Milton Dewey	SLR
Lansing, Jack Courtney	SLR
Leonard, John Lawson	SLR; DIK
Levitt, Morse David	SLR
Lewis, Harold McQuade	SLR; DIK
Lockwood, Albert Curtis	SLR; Note 5
Lee, George F.	Note 6
Lewis, David Everett	SLR; EOT
Lawrence, Dudley B.	WDM
Lawrence, Almon Rowell	SLR; EOT
Logan, John A.	SMM
Lyle, Samuel P.	LDT
Logan, Leland	SMM
Lindsay, Oliver C.	PFO
Laezar, Augustus	DIK
Leek, John B.	DIK
Linder, John	DIK
Logel, Joseph F.	DIK
Lachmund, Harry G.	LHV
Lyons, Philip T., Jr.	DIK

(*Continued on page 738*)

One of the American aviation fields in France

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FOREIGN NEWS

FRANCE

The official report of the War Office June 10 says of aerial operations:

"On June 9 our pursuit escadrilles destroyed or put out of commission eleven enemy aeroplanes. Our bombing aeroplanes attacked without respite enemy troops massed behind the front of the attack.

"In the day of June 9 and the following night, despite the bad weather, eighteen tons of projectiles were dropped on concentration points, convoys, and railway stations, particularly the station at Roye, where a great fire, followed by explosions broke out.

"During the month of May, 28 German aeroplanes were brought down by means of our anti-aircraft guns, three of them at night. Twenty other machines, damaged by our fire, were obliged to abandon their mission."

The French official report of June 11th says:

"Our day bombing machines continued their operations on June 10, despite the bad weather, against points of a more exposed nature on the battlefield. Aeroplane groups, flying low, dropped projectiles on enemy concentrations, dispersing reinforcing troops and causing considerable losses

"Certain squadrons made sorties, and during the day eight tons of explosives were employed in this manner, giving the best results.

"On the night of June 10-11, the bombing of the enemy's rear areas was continued actively. Our escadrilles dropped twenty tons of projectiles on convoys, cantonments and railway stations, as well as on two munition depots

"An explosion occurred in the region of Chaulnes, another in the neighborhood of Soissons. A fire is reported to have broken out in the station at Fismes.

"On June 10 four German planes and one captive balloon were brought down by our pursuit machines."

The night report of June 12 from the French War Office thus summarizes aerial operations on the front of the German drive:

"Our day bombing machines continued their operations yesterday, participating with their usual audacity in a counterattack launched by us on the Montdidier-St. Maur front. They attacked with bombs enemy divisions who had come up to sustain the shock of our troops against the right wing.

"Before this attack the enemy units were obliged to disperse, leaving dead on the ground, convoys were bottled up, and heavy artillery batteries, under heavy punishment, were abandoned by the gunners, who ceased to fire. A convoy took fire, and a great fire broke out in Ressons-sur-Matz, where there was a large concentration of enemy troops. A total of twenty-six tons of projectiles were dropped with excellent results.

"During the night our bombing squadrons dropped thirteen tons of explosives on railway stations in the enemy zone, notably in the region of Nesle, Roye, and Ressons- sur-Matz. Additional fires were started by these bombardments.

"On June 11 our pursuit machines brought down or put out of commission thirteen enemy planes."

The War Office on June 13 issued the following:

"On June 12 our bombing planes dropped in the battle zone sixteen tons of projectiles, and twenty-five tons last night on cantonments, convoys and marching troops behind the enemy front, and bombarded, as well, the villages of Ressons-sur-Matz, Richquebourg and the regions of Roye and Guignicourt. Several fires were observed. The same day seven enemy aeroplanes were brought down and nine were put out of action.

"In the first week of June thirteen enemy planes were brought down by anti-aircraft guns. One hundred and ten aeroplanes, carrying 32 bombs each, charged at the height of 1,000 yards and broke up an enemy concentration.

GERMANY

The official statement regarding aviation, issued on June 10, says:

"Thirty-seven aeroplanes and six captive balloons were shot down yesterday."

The evening official statement of June 13 from General Headquarters says:

"In the last two days thirty-five enemy machines have been shot down. Captain Berthold and Lieutenant Menkhoff obtained their thirty-third aerial victory; First Lieutenant Schleich, his twenty-ninth and thirtieth; Lieutenant Veltjens, his twentieth and twenty-first, and Captain Reinhardt, his twentieth."

GREAT BRITAIN

The Germans bombed British hospitals in France seven times between May 15 and June 1, according to a statement made in the House of Commons by J. I. Macpherson, Under Secretary of the War Office. The casualties numbered 991. These were as follows:

Killed—Officers, 11; other ranks, 318; nursing sisters, 5; Women's Auxiliary Corps, 8; civilians, 6.

Wounded—Officers, 18; other ranks, 534; nursing sisters, 11; Women's Auxiliary Corps, 7; civilians. 73.

The official statement on aerial operations June 10 says:

"On Sunday our flying squadrons, co-operating with the French on the Noyon-Montdidier battlefront, worked continually from dawn till dark. Our bombing aeroplanes impeded the enemy's advance and harassed his troops and transport with constant machine gun fire.

"Strong patrols of scout machines swept the battle area throughout the day, while high flying aeroplanes protected those below from air attack.

"Among the targets hit were an aerodrome near Roye, where hostile machines on the ground were set afire, an ammunition dump at Montdidier, which went up in a sheet of flame, canteens and wagons at Couchy, lorries at Laguy and Hainvillers, and infantry in trenches and on the roads along and behind the whole fighting line.

"On the British front there was little enemy activity in the air, but our machines carried out a good deal of artillery observation work until stopped by rain. One of our artillery machines forced a two-seater German machine to land and surrender at the aerodrome to which our machine belonged.

"Fourteen other German planes were downed and four disabled. A hostile balloon was shot down in flames. Four of our machines are missing."

The official statement on aerial operations for June 11 says:

"In spite of the cloudy weather yesterday our airmen on the French battle front worked early and late, dropping eight tons of bombs on enemy troops, transport and ammunition dumps, guns and trenches. Direct hits were obtained on the railway at Roye-sur-Matz and concentrations of infantry in the triangle comprising Montdidier, Richquebourg and Roye.

"Flying low, our machines attacked with machine gun fire every target that offered itself along the roads behind the fighting line, and an immense number of rounds were fired from the air with good effect.

"In this area we shot down six enemy aeroplanes and drove seven down out of control, we ourselves losing five machines.

"On the British front there was little aerial activity. One German aeroplane was destroyed and one was driven down out of control. We lost two machines.

"During Monday night we dropped seven tons of bombs on Cambrai and Bapaume. All our night bombers returned."

Field Marshal Haig's report from British headquarters in France June 12 says:

"Twenty-one enemy aeroplanes have been destroyed on the Italian front by the British air forces operating there.

"Yesterday British aeroplanes assisted French aviators in a counter-attack on the western portion of the Noyon battle front by special patrols sent out to deal with German machines, as well as by vigorous and constant bombing of enemy trenches, gun positions, and communications.

"A heavy machine gun fire was directed from a low altitude upon hostile troops and transports throughout the same area.

"Ten German aeroplanes were destroyed during these operations and four were driven down out of control. We lost three machines.

"Two of our machines reported yesterday as missing have returned.

"Since the German attack began on the Noyon sector on June 9, our squadrons, co-operating with the French, dropped twenty-one tons of bombs and accounted for twenty-nine enemy machines.

"The total weight of bombs dropped by us yesterday, including those dropped beyond the French battle lines, amounted to fourteen tons. On Tuesday night our night-bombing machines heavily attacked the railway at Cambrai and billets at Frémincourt, dropping four tons of bombs without loss.

"On the British front two hostile machines were shot down and two others were driven down out of control. One of our machines is missing."

The official statement on aerial operations issued June 13 says:

"During yesterday's operations light bombardment squadrons performed the unprecedented feat of attacking German heavy gun batteries in action and silencing them by killing or scattering the gunners.

"Our flying squadrons on the French battle front were chiefly engaged in offensive patrol work, seeking German machines and fighting them wherever found. They destroyed fifteen enemy aeroplanes, some of which went down in flames, others broke in the air. One of our machines in this sector is missing.

"On the British front a good deal of aerial reconnaissance, photography and artillery observation was carried out. We lost two machines and destroyed five German machines. Two other hostile machines were driven down out of control, while a German observation balloon was brought down in flames.

"Twenty-two tons of bombs were dropped by us during the day, the principal targets attacked being the Don junction, railways at Courtrai, Armentieres and Chaulnes, a dump at Bapaume and the Bruges docks. The weather at night was unsuitable for flying. Two successful raids were carried out by our squadrons against the Metz Sablons railway station and sidings. Many heavy bombs were dropped. On Thursday one squadron of our aeroplanes attacked the station of Treves, another dropped a ton of bombs on factories and the station at Dillingen. At the same time factories and the station at Hagendangen were subjected to an attack. At Dillingen direct hits were observed on two furnaces. Successful long distance photographic reconnaissances were carried out by other machines.

"In the course of attacks made by the enemy on our bombing machines, one hostile aeroplane was destroyed and two others were driven down. One of our machines is missing."

The British statement for June 16th says, "Twelve German machines and one balloon were brought down by our airmen yesterday. Nine tons of bombs were dropped on Zeebrugge Mole and on other targets in France. Flyers of the Aegean Squadrons bombed enemy works and aerodromes on the Turkish and Bulgarian coasts and shot down two fighting scouts. Five of our machines are missing.

During the period between June 6 and 9, inclusive, ten bombing raids were carried out, according to an Admiralty statement. The objectives were Thourout, Zeebrugge lock gates, the Brugeoise works, Bruges docks, Bruges Canal, Chistelles aerodrome, Marialter aerodrome, St. Denis-Western aerodrome and the Mostacker aerodrome.

"In all," says the statement, "fourteen tons of bombs were dropped. Fires were started in the Bruges docks, the Marialter aerodrome and and the St. Denis-Western aerodrome. Four fires and two explosions were caused in the eastern basin at the Bruges docks. Two direct hits were observed on the Mole at Zeebrugge. Heavy anti-aircraft fire was experienced and attacks by enemy aircraft were driven off.

"In home waters during the same period numerous anti-submarine and hostile aircraft escort patrols were carried out by seaplanes, airships and aeroplanes. Submarines were sighted and bombed, enemy lines were located and floating mines sunk.

"On occasions while on patrol single British machines have been attacked by enemy formations. In one case a stray bullet shot away the control and a British machine was forced to alight. The crew subsequently was rescued by another British seaplane which had been sent in search for them. In another instance our machine, after being disabled, was sunk by hostile machine gun fire, the crew being rescued."

ITALY

Five hostile aeroplanes were brought down and four tons of bombs were dropped on the enemy's depots and communication junctions, according to the official statement issued by the War Office on June 10.

The official report from Headquarters at Rome issued on the 11th of June says that during the day five Austrian aeroplanes were brought down by the Italians.

MODEL NEWS

Edited by John F. McMahon

Model Aeroplane Building as a Step to Aero Engineering

PUSHER type models, that is the twin propeller racing kind, are easier to balance than the tractor single propeller type, this is why 90 per cent of the model flyers today prefer the former.

Much difficulty was at first experienced with tractors, especially in the way of longitudinal stability, and for this reason model flyers in the early days of 1910 and 1911 abandoned them entirely.

In the last few years tractors have taken their place in the model records only because model flyers of today do not try to copy the big machines as the older flyers did.

The trouble was the older flyers, in attempting to copy Bleriot, Antoinettes, Moranes, etc., succeeded in only partially doing so, for, while the shape of wings and fuselage, etc., was tolerably similar to the full size prototypes, in the most important part of all, namely, the distribution of weights, they failed utterly. Generally the center of pressure of the main plane of the full size machines varies but little from the center of gravity. In models of the early days the center of gravity came about the mid-section of the fuselage, and of course the model was entirely out of balance, and when attempting to fly it would slide back on its tail.

Model flyers became so disgusted with troubles encountered by flying tractors that they turned to the copies of the Voison Canard, Valkyrie, and others. These types had the main planes at the rear, traveling sort of tail first; at the front of the machine a small elevator was placed at a greater angle of incidence than the main plane and this succeeded in stabilizing the machine longitudinally while in flight.

In 1913 records with tractors began to climb and only because model flyers began to construct models after their own ideas. The most successful was a little machine constructed by Chas. V. Obst traveling on an average of 800 feet distance and as much as 40 seconds duration. In order to overcome the old difficulty he moved his main plane back to one-third the distance from the nose of the machine as shown in the figure at the top of the accompanying drawing.

The trouble with rubber driven tractors is on account of the motor running all the way to the rear; naturally the center of gravity then lies about the center of the frame. The only thing that can be done to correct a condition of this kind is to make the propeller heavier, thereby adding a lot of unnecessary weight, or by shortening the motor to about two-thirds of the distance from the nose of the machine, which would of course shorten the flight of the model.

I have seen a tractor model four feet long, having the main plane about 24 inches from the nose of the machine, fly long distances and keep absolutely stable, so from this model flyers will see that in order to make a successful tractor the whole secret is to balance the model properly without trying to copy the large machines too closely.

The accompanying drawings clearly show how the balance of a model varies from the big machine.

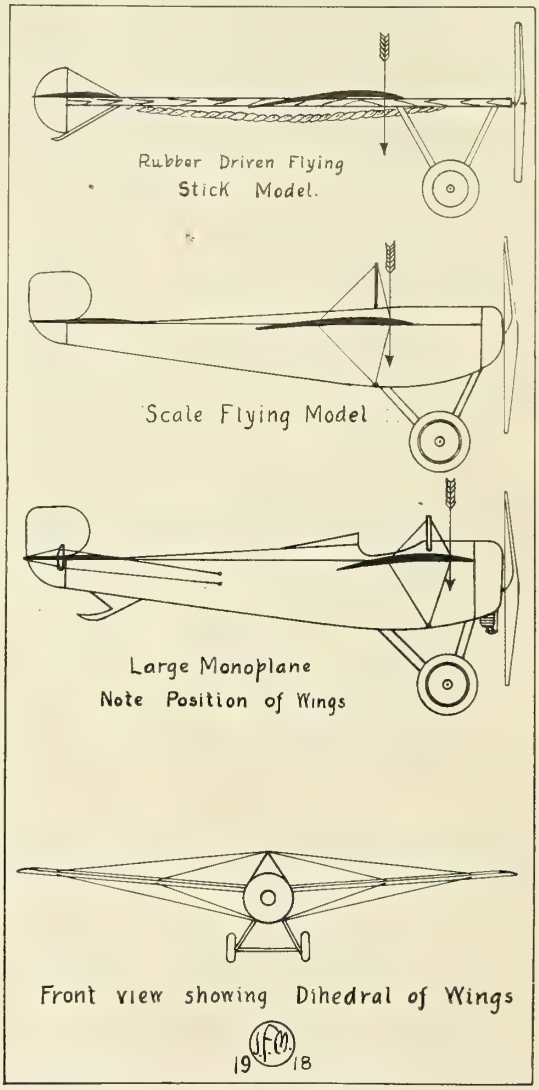
At the top of the drawing is a rubber driven flying stick model of the racing type. The rubber motor runs to the rear of the frame, and of course the center of gravity lies at the point indicated by the arrow. It is only necessary to place the wing over this point, giving the plane a slight angle of incidence, to make the model balance perfectly.

The next figure shows a scale model of a monoplane driven by rubber bands. The model resembles the large machine in every way, only that the wing must be moved back considerably to a point over the center of gravity, which will not affect its flying qualities any.

The 3rd figure shows a large size machine. The readers can clearly see why it is possible to get the main plane so near to the nose of the machine. The weight of the motor in the nose of the machine brings the center of gravity well up to the front of the machine. Also the weight of the pilot and fuel help to accomplish the same thing. This allows for a close coupling of the motor and the pilot's seat, making the machine easy to control.

At the bottom the figure shown is to show the reader how, by giving the wings what is known as a dihedral angle, to help the machine to become almost inherently stable. Inherent stability is quite a study and we will treat it in another article.

(To be continued)


Rubber Driven Flying Stick Model.
Scale Flying Model
Large Monoplane Note Position of Wings
Front view showing Dihedral of Wings
J.F.M. 1918

The "Junior Aeronautical Reserve"

The Aero Club of the Lane Technical High School of Chicago, Ill., have become a unit of the "Junior Aeronautical Reserve." Secretary of the Club Mr. Geo. G. Neuman says the Club realizes the benefits to be gained in co-operating with a movement of this kind, especially when you consider the help model flyers can give their country later.

The "Junior Aeronautical Reserve" now has two prominent Clubs as members of this organization, the one mentioned above and the Correspondence Model Aero Club of Babylon, L. I., and also scores of individuals from all over the United States who would like to become affiliated with Model Clubs to take up this work.

A list of Model Clubs appears from time to time at the top of Model News, and it would be well for Model flyers who wish to take up the study of Aeroplane flight and Construction, to get in touch with secretaries of the Clubs nearest them, and tell them they wish to take up Model Aeroplane Building to help them to better their aeronautical knowledge.

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

'Plane o' Mine

(*With apologies*)

When you are happy, 'plane o' mine,
And all your parts are true,
Show me your worth, your speed divine,
And let me soar with you.
Show me the prop that spurs you on,
The stunts you mean to do,
The twists and turns that foil the Hun,
And let me joy with you!

When you are mad and hard to hold,
And all the skies are dark;
When you plunge through the beastly cold
And leave me stiff and stark;
When you are wobbling to and fro,
As only B.E.'s do,
Tell me what breaks and brings you low,
And let me stand with you!

So, when the sight falls tremulous,
When the last strut droops low,
And one of us, or both of us,
The long, long drop must go;
When the old petrol-tank's aflame,
And everything's askew,
Whatever fate our souls await,
Still will I "swear by" you!

"Say, Mister, will ye please take Robert fer jest a short ride? He's got th' airy-plane bug bad."

Heard on the Street

Have you noticed how many girls are wearing Liberty buttons now?

Yes, they are all the style and reasonable, too.

More Truth Than Poetry

Speed the lathe!
Our men to save!

To give the Kaiser pains
We'll make enough of those scout planes,
Until they become *rout planes.*

C. W. T., Roselle Park, N. J.

An Alphabet

A is for the air that supports us on high,
B for the blue of the smiling sky.
C stands for currents that speed us along,
D for the death when something goes wrong.
E is the elevator that guides our flight,
F the fuselage where we sit snug and tight.
G stands for gas that makes engines go,
H is the Hun we all despise so.
I for injustice of reducing our pay,
J stands for Jehovah—guide us we pray.
K for Kilometers we travel each hour,
L is the light that gleams from the tower.
M the metres square in our plane,
N stands for nerves that endure every strain.
O is the oil for engine, joint and wire,
P means the pusher of which we soon tire.
Q is the quiz that makes cadets hump,
R is for rubber, it eases each bump.
S is the surface kept shining and bright,
T stands for training that makes us fly right.
U for the use we will be in this war,
V for the victory we expect more and more.
W is for good weather on which we depend,
X the ex-perience of value without end.
Y stands for yellow that none of us show,
Z for the Zip that makes it all go.

H. F. Greaves.
1st Lt. A.S.S.C., A.E.F., France, American Air Service.

My Flying Boy

(*The Mother's Point of View.*)

My daring, wonderful, flying boy
With his movements quick, his eagle eye,
He finds his way in the pathless sky,
And skims the clouds with a reckless joy.

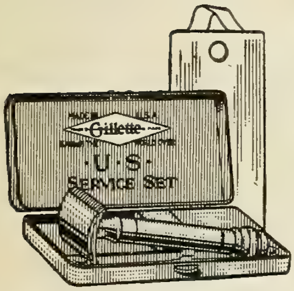
With dauntless courage and iron nerve
He mounts, and he floats, and dips, and turns,
And feels the kiss of the sun that burns,
And the rushing wind in every curve

I see him afar, a speck above,
In the rosy clouds, a shining beam,
And wonder if it is all a dream,
And I only see a dear white dove.

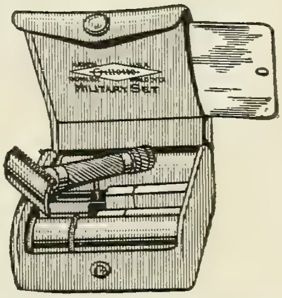
I am waiting here with speechless joy.
I pray for his safe return to me.
I hear him approach, my humming Bee,
My daring, wonderful, flying boy.

Lily Gordon-Ascher.

Gillette SAFETY RAZOR



The New U. S. Service Set.—A solid metal case, heavy nickel-plated and embossed with the insignia of the U. S. Army and Navy. Strong, thin, compact: 1⅞ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box, indestructible Trench Mirror inside the lid $5



Military Set No. 18—For Uncle Sam's Officers. a Gillette Combination Set, in case of U. S. Regulation Khaki twill—nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges). $7

It's no trick at all to get a clean, comfortable shave in "once over" time with a Gillette

Thousands of men, in every Army and Navy of the civilized world, have "proved up" the Gillette under the most difficult shaving conditions that any razor was ever asked to meet. Here is the real *service razor*—and it brings home-comfort into ship and camp.

Have you seen the new Gillette Sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette Organization in the Service — men who know what the fighting man is up against.

Simple and compact, fit the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready. No Stropping—No Honing. When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen, or Y. M. C. A. Hut, here in America or overseas.

Our Paris Office carries stocks — is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy, and the Eastern battle fronts.

Gillette Safety Razor Co.
of Canada, Ltd.
73 St. Alexander St.
Montreal

Gillette Safety Razor Societe
Anonyme
17 Bis, Rue La Boetie
Paris, France

Here's the Way to Get 100% Efficiency Out of Your Gillette

Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in — that's essential with any shave.

Put in a new blade and screw the handle down *tight*. If you want a specially close shave, *unscrew* the handle a *part turn*.

Hold the razor *naturally* and *easily*, and tilt the handle so you can just feel the blade engage the beard.

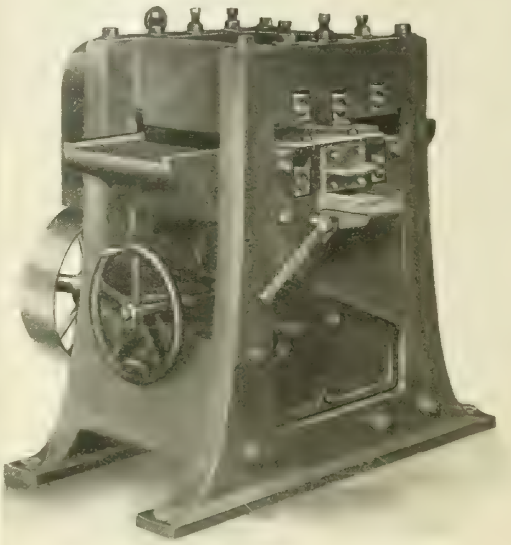
Then shave with short slanting strokes. It doesn't require any brute force to shave with a Gillette—the razor does the work.

Gillette Safety Razor, Ltd.
200 Great Portland St.
London, W., England

A. G. Micheles
53 Liteiny, Petrograd, Russia

Vedova Tosi Quirino & Figli
Via Senato, 18
Milan, Italy

Gillette Safety Razor Company
Boston Mass·U·S·A·



Whitney Scraping and Toothing Machine

Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a

WHITNEY

Toothing Machine

If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

Write for catalog
and samples of toothing

Baxter D. Whitney & Son
WINCHENDON **MASSACHUSETTS**

(Continued from page 733)

Liggett, Arthur George	SLR; KST
Lockhart, Frank	FRF
Loder, James A.	DIK
Low, Raymond P.	FRF

M

Marion, Ralph	SLR; VBW
Miller, Lester J.	FRF
Marshall, Howard Parsons	SLR
Mihleder, Philip George	SLR
Miller, John H.	SLR; Note 5
Midkiff, Robert Forrest	SLR
Marsh, Ralph Arnold	SLR; KST
Martin, Charles J.	FRF
Moore, John S.	PWM
Mitchell, Donald Harlow	SLR; PMT
Midyette, Dayton Ralph, Jr	SLR
Moon, Odas	SLR; EOT
Murphy, Ralph Joseph	SLR
Morris, Harley	SLR
Morris, David Benjamin	SLR
Marshall, Charles Clark	SLR
Maitland, Lester James	SLR
Mahoney, Frank Herbert	SLR
Morrow, George Dwight	SLR; EOT
Matthews, David Robert	SLR
Malone, William Joseph	SLR; VBW; FRF
Mitchell, Donald H.	FRF
Macauley, Theodore C.	JMA
Montijo, John Gregory	FRF
Meixner, Howard F.	WAC
Mapes, Gordon Walter	SLR
Marshall, Furber Ingram	SLR
Marshall, William Jefferson	SLR
Miller, Marion Lewis	SLR
Moore, Harold Amos	SLR
Moores, Kenneth Albert	SLR
Manning, Lucius	SLR; FRF
Martel, Alfred, Jr.	SLR
Mason, Chauncey Carey	SLR
Moore, David Harris	SLR; EOT
Maynard, Kenyon Cushing	SLR; AAD
Mulcahey, Edward Patrick	SLR; LDT
Mulvihill, Bernard Hampsey	SLR; DIK
Muckley, Robert Latour	SLR
Morsch, Jesse Julius	SLR
Moore, Charles Chilton	SLR
Mills, Robert Rourke	SLR
Meehan, Timothy E.	TFT
Moffat, Reuben C.	TFT
Mennies, Michael	SLR; KST
Meyers, Harold	TFT
Munchhof, Theodore Joseph	SLR; RSD
Marsh, Albert E.	DIK
Massey, Raymond R.	DIK
Meldahl, Carl J.	DIK
Merrill, Kieth B.	DIK
Mess, Robert W.	DIK
Moore, Rush I.	DIK
Morehead, John L.	DIK
Morgan, Stuart A.	DIK
Morris, Edward S.	DIK
Moye, Frank L.	DIK
Mulvihill, Mead J.	DIK
Moody, Corbitt L.	MAC
Meyer, Alfred F.	MAC
Miller, Edward A.	CWT
Minter, Clarke Cothran	SLR; CWT
Murphy, Dan W.	SMM
Malott, Volney T.	Note 10
Mayer, Arthur C.	PFO
Mason, Earnest J.	DIK
Morehead, Joseph H.	DIK
Mahan, William Joseph	SLR; EOT
Metzger, Carlisle Leland	SLR; CWT
Mathews, James C.	PWM
Merrill, George B.	TFT
Minster, Harry T.	TFT
Moran, William J., Jr.	TFT
Marincik, Joseph A.	DIK
Macniel, Bruce	SLR; RSD
Marriott, Charles A.	FLR
Martin, Roland H.	EOT
Meyer, Walter W.	EOT
Midyette, Dayton R., Jr.	DIK
Montagne, Alfred A.	FRF
Metcalf, Frank	FRF
Monteith, Percy L.	FRF
Morrissey, Raymond A.	DIK

Mc

McKinnon, Angus G.	FRF
McMullen, Alexis Brenier	SLR
McCaffery, James A.	FRF
McGrath, Michael F.	DIK
McDaneld, Edward Fletcher	SLR; VBW
McBride, Walton E.	PWM
McAllen, William Daniel	SLR
McCabe, Roscoe Ellis	SLR
McCulloch, John Myers	SLR
McNamara, Laurence Joseph	SLR
McCleary, Frank	SLR; VBW
McNeil, Horace J.	FRF
McIlhiney, Donald W.	FRF
McCaffrey, Aubrey L.	DIK
McVickar, John B.	FRF
McCormack, Ralph Clinton	SLR; CWT
MacWhorter, Robert H.	CPR
McDonough, Hubert Boniface	SLR; EOT
McKinney, Oakley Walls	SLR; DIK
McNaught, Roy Joseph	SLR
MacMechan, Dunbar Dene	SLR
MacRae, Harry Rotsford	SLR
McGrillis, Jacob Wilson	SLR; DIK
McDonald, James Francis	SLR
McHugo, Jack Robson	SLR
McAneney, Earl Raymond	SLR; KST
McDowell, Roy C.	DMA
McGovern, John E.	DIK
McKinzie, Wesley R.	DIK
McCahill, Samuel S.	MAC
McKinnon, John A.	SMM
McBride, Howard Inman	SLR; RWT
McLean, Lucian L.	VBW
McCarron, Henry A.	PFO
McFalls, Edwin L.	PFO
McFerren, Francis A.	DIK
McFarland, William P.	TFT
McKey, Claude D.	TFT
McMurphey, John William	SLR; KST
McGrath, Michael Francis	SLR; GLC
MacDonald, Charles S.	REV
McCabe, Ross	EOT

N

Nunemacher, Francis Warren	SLR
Nigh, Gordon Kincaid	SLR; EOT
Night, William J.	FLR; CDT
Nunn, James Dabney	SLR; KST
Nevin, John, Jr.	PFO
Nott, Sherrard G.	PFO
Nelson, Carl Edward	REV
Naugle, Frank S.	FRF
Nichols, George W.	FRF
Nordin, Oscar	EOT
Nash, Roland Lewis	SLR
Nims, Homer Willis	SLR
Nulson, Norman Lee	SLR
Nunn, William Theodore, Jr.	SLR
Nissager, Fred David Mathias	SLR
Norton, Harrison Edson	SLR; LDT

O

Oliphant, Rufus Alexander	SLR; EOT
O'Shea, Edward Marshall	SLR; AAD
Organ, John David	SLR
Oliver, Phillip E.	FRF
O'Briant, Conrad Luther	SLR
Oliver, Walter Lloyd	SLR; BST
O'Malley, Edward Lewis	SLR
Osborne, Thomas Wesley	SLR
O'Hanley, Myrom Emmett	SLR
Owen, Ross George	SLR
O'Connell, Robert E.	DIK
Olds, Harvey R.	DIK
Ort, Karl S.	DIK
Orsinger, Remington	TFT
Oliphant, Rufus A.	LHV
O'Connor, Thomas F.	PFO

P

Proctor, Willis Heath	SLR; EOT
Pheatt, Merrill Norton	SLR; AAD
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Potter, James Harold	SLR: EOT
Parsons, Arthur M.	FRF
Parr, Givens A.	FRF
Parks, Ralph O.	PWM
Parmlee, Charles R	PWM
Pendleton, Albert G	PWM
Penick, John N.	PWM
Pettingell, John M.	PWM
Pierson, Walter E.	PWM
Pawley, George P.	PWM
Putnam, Kingman W.	PWM
Pattiani, Alois W.	PWM
Pickup, Christopher V.	PWM
Pulliam, Ralph C.	PWM
Pendleton, Archibald F	PWM
Putnam, Russell Lorain	SLR: BST
Palmer, Hubert Phillips	SLR
Peterson, James H.	DIK
Pearson, Raymond I	AGC
Paine, Topliff Olin	SLR
Parish, Cheaney Land	SLR
Payne, Bryant Watson	SLR
Prosser, Stuart Alexander	SLR
Pearson, Wallace Drake	SLR
Pratt, Eric Torrens	SLR
Price, Henry Wales	SLR
Patton, Hilton M.	DIK
Peters, Hallam H	CGC
Pedler, Harry Wesley	SLR: LDT
Peek, Norman W.	Note 6
Parker, Robert M	TFT
Pascoe, William H.	TFT
Prindle, William D	DIK
Pinkstaff, Everett Wilson	SLR: KST
Peterson, Ernest J.	TFT
Pond, Richard E.	TFT
Patterson, Walter K.	FLR: VBW
Phelps, Samuel Bixby	SLR: EOT
Paige, William Julius	SLR: EOT
Poleman, Thomas Theobald	SLR: KST
Pilcher, Rufus James	SLR: KST
Pennington, Jerome Edward	SLR: LDT
Prosser, Frank Hallam	SLR: RSD
Parsons, Gustav A.	DIK
Penfield, Charles C.	DIK
Pitts, Younger A.	DIK
Price, Owen N.	DIK
Potter, James H.	PWM
Proctor, Willis H.	PWM
Petrill, John M.	DIK
Patterson, Robert E	DIK
Phillips, Donald B.	DIK
Peck, Lee H.	PFO
Pursley, Charles A.	SMM
Pardee, Max A.	EOT
Perry, Marney D.	PFO
Pendell, Elmer	TFT
Pope, John B.	TFT
Phillips, Walter P.	FRF
Patterson, Fred R.	FRF
Pfaff, Leo G.	FRF
Pinckney, Gerald J.	LHV
Petree, Lee W.	EOT
Pratt, Eric T.	DIK

Q

Queen, Harold Ellis	SLR; RSD; FRF
Quinlan, Charles Gordon	SLR
Quaintance, Charles Linsey	SLR; EOT

R

Redin, Roy Wilmer	SLR
Robinson, Clarence Abraham	SLR
Robertson, Archie McIntyre	SLR
Reavis, Carlos Loretto	SLR
Richards, Walter Eugene	SLR
Rose, Rolland L.	PWM
Rose, Elmer J.	PWM; FRF
Rose, Glenn Walter	SLR; RSD
Roberts, Francis M.	PWM
Roberts, Fred G.	LHV
Randell, Hugh P.	PWM
Raibourn, Claude	PWM
Rivers, Harold R.	PWM
Roll, Frederick A.	PWM
Rossen, Horace G.	PWM
Ross, Malcolm H.	LHV
Read, James Kempt	SLR; KST
Rooney, James R.	FRF
Rourke, Frederick W.	FRF
Ricciardi, Attilio	SLR; AAD
Riddle, Earl C.	FRF
Rauh, Joseph Anton	SLR; EOT
Rowe, Hiram Hatch	SLR; RSD
Pitrat, Charles Stuart	SLR; LDT
Ragatz, Edward Gray	SLR
Ransom, Harold Browne	SLR
Ratcliffe, Kent E.	SLR
Rechsteiner, Victor Martin	SLR
Reeve, Frederick Jay	SLR
Romans, Edgar Dwight	SLR
Ronan, John Aloysius	SLR
Rowe, Harold Dalton	SLR
Rabbitt, Ora Clyde	SLR
Robinson, Frederick Alfred	SLR
Root, Homer Roice	SLR
Rummel, Jay Arnold	SLR
Ryan, Robert Emmet	SLR
Ratekin, Otis Benjamin	SLR
Royer, Walter Earle	SLR
Ready, James Baird	SLR; GLC
Reilly, Walter Sheridan	SLR; KST
Russell, Franklin Brundage	SLR; EOT
Rohrbach, Charles Henry	SLR; EOT
Reed, Carroll Goffin	SLR; RWT
Robbins, Leo Rosewell	SLR; EOT
Rabenstein, Maurel King	SLR; KST
Robbins, Ralph Brainard	SLR; CRI
Rascovar, Frank James	SLR; Note 2
Roberts, Estill G.	Note 9
Rolleston, Moreton Mountford	SLR; CAF
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Royer, James A.	DIK
Robertson, Charles B., Jr.	DIK
Rogers, John P.	DIK
Ray, Harvey T.	DIK
Robinson, Malcolm G.	DIK
Russell, Laurence L.	DIK
Richardson, Elmer Clark	SLR; RSD
Roe, James A.	FRF
Rust, Charles E.	FRF
Rozier, Thomas C.	FRF
Rogers, Frank W.	FRF
Rask, Peters S.	EOT

S

Scott, James Hardin	SLR
Stites, James Walker	SLR
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Schwartz, Charles William	SLR
Shaw, William Ferdon	SLR
Shine, Ira James	SLR
Sloniger, Eyir L.	SLR
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Spilman, Louis	SLR
Spiner, Louis Harry	SLR
Stedman, Boyd, Jr.	SLR
Stine, Harold Blaine	SLR
Sullivan, Charles Wesley	SLR
Stanford, Frank Curtiss	SLR; RSD
Sanford, Edwin Ware	SLR; PMT
Stewart, John H.	PWM
Swingley, Charles E.	PWM
Stollenwerch, Guy	PWM
Sheffield, Loren C.	PWM
Shull, David R.	PWM
Shorney, George H.	PWM
Speidel, Frank K.	PWM
Stenberg, Bernard A.	PWM
Stuart, George D.	PWM
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Stoffregen, Hugh M.	PWM
Search, Hendrick M.	FLR; CDT
Signer, John W.	FLR; CDT
Sills, Archie L.	FRF
Stevens, Dillon T.	LHV
Schustedt, Frederick N.	FRF
Skagerberg, Rutcher	FRF
Sands, Frank T.	FRF
Sullivan, Charles W.	BST
Swinney, John J.	FRF
Skanse, Peter E.	FRF
Shelton, Carroll E.	FRF
Shaw, James M.	FRF

The Aircraft Investigation

(*Continued from page* 714)

Mr. Hughes opens his hearings at an early hour and they continue until late in the afternoon with but a brief luncheon recess.

From facts placed in the record within the past few days, it is made clear that Mr. Hughes is running down every report of inefficiency, and that he is acting with the thoroughness which brought him into the limelight in the New York insurance investigation. Although many of the facts being adduced will never be given to the public, lest they reach the hands of the enemy, much information which, up to this time has been refused, will be made public.

From evidence bearing upon the efforts of the Signal Corps to give fronts held by General Pershing's men adequate air defense, it has been brought out that there are now at the front 378 aeroplanes bearing the American insignia. These planes are being used by the American aviators who constitute seven squadrons. Few of the planes are of American manufacture.

There are now 1,746 American aviators in France. A large share of this number are ready to go into the air fights, but only 126 have been provided with equipment. There is an equal number of observers and 38,367 enlisted men to act as mechanicians and aerodrome men are at work completing the flying fields to be used by the American forces.

That the training of aviators has progressed with far greater speed than has the production of aircraft is evidenced by the fact that there are in this country today 3,467 trained aviators and 4,922 observers and non-flying officers awaiting orders to proceed to France. The enlisted men, many of whom have finished their mechanical training at the flying schools in this country total 99,001.

It would appear that the capacity of the twenty-seven training schools of this country is approximately 3,500 men. At the present time there are about 3,394 men being trained as aviators at the flying schools and 3,393 at the ground or preparatory schools. About 4,236 men, passed by the examining boards, are awaiting an opportunity to enter the ground schools. There are 1,036 men who are taking advanced training courses in this country perfecting themselves in pursuit, bombing or observation work. About 2,500 Americans are being trained in schools in France, England, Italy and Egypt.

From records brought up to date two weeks ago, it appears that the Aircraft Board ordered 5,300 elementary planes, 2,100 advanced training planes and 11,000 combat planes. The engines ordered comprise 10,200 for elementary planes, 6,692 for advanced planes and 27,300 for combat planes. The program also included orders for 35,913 propellers, 1,077 balloons, 843,735 bombs and thousands of machine guns.

Definite figures of deliveries of aeroplanes and equipment will not be placed in the record of the evidence until later, it is understood. It is known, however, that planes delivered from American factories include 4,365 elementary, 620 advance, 114 combat and 195 experimental. Engines delivered include 6,126 elementary 1,815 advanced training and 1,043 combat. More than 13,863 propellers have been delivered and more than 31,146 machine guns. About 125 balloons are in use.

There will be a thorough investigation of the statement, that the average price of the planes, propellers and parts of an aeroplane is $5,000 and that anywhere from $1,950 and $5,000 more is needed to equip the plane with an engine and its spare parts. Some of the manufacturers are inclined to criticise estimates which make possible a $10,000 airplane, pointing out that there are few automobiles which approach that price. To date $105,000,000 has been spent for complete airplanes, with an additional $11,000,000 for general equipment, including instruments. The total obligations of the Board as of May 23 were $859,839,974.36.

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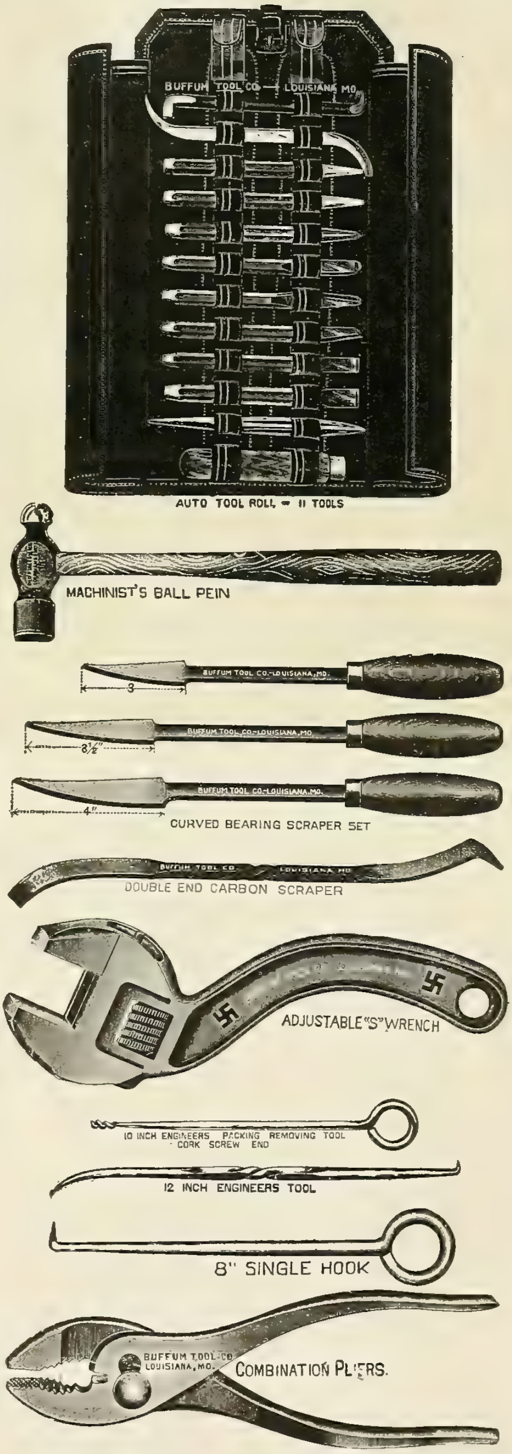
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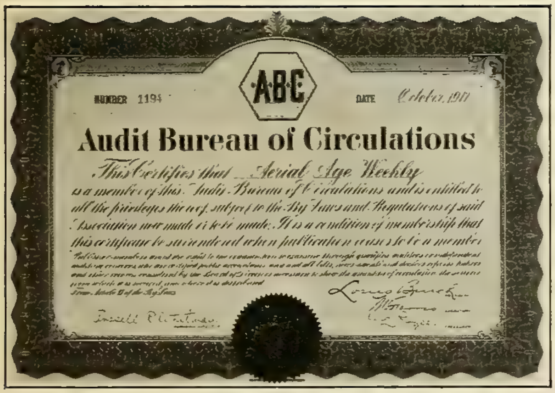

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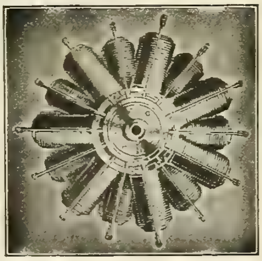

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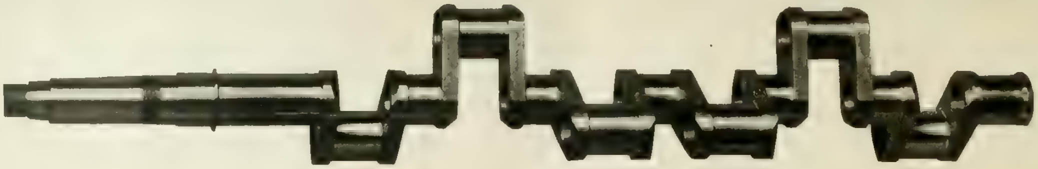

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T

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Thorn, Earl A.	EOT

U

Utley, Charles B.	PFO

V

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Vause, Norman J.	FRF
Vaden, Ferris Edgar	SLR
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Van Gooding, Carlos Clay	SLR
Vance, Alfred William	SLR; CWT
Vincent, Charles R.	WFO

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White, Oscar	SLR; KST

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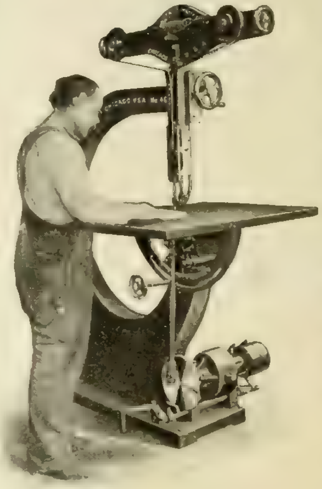

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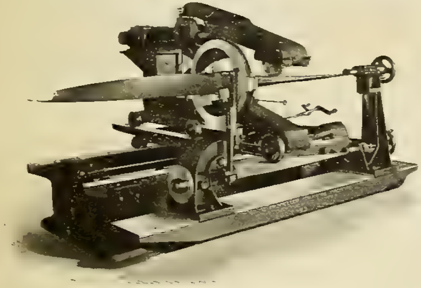

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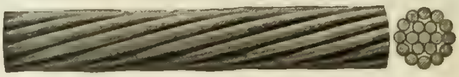

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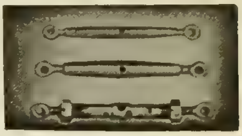

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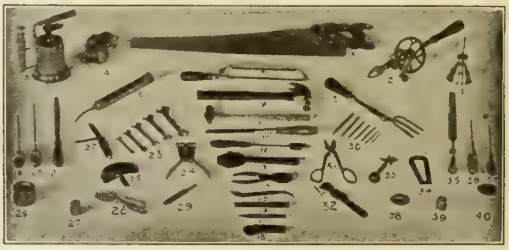

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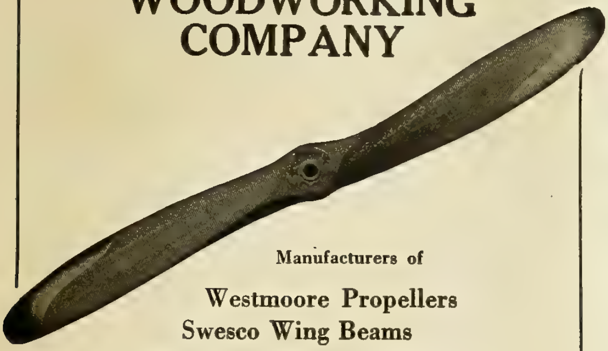

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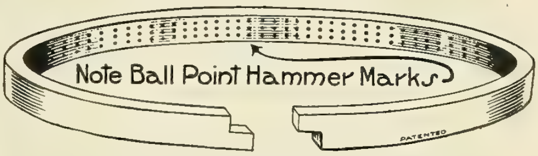
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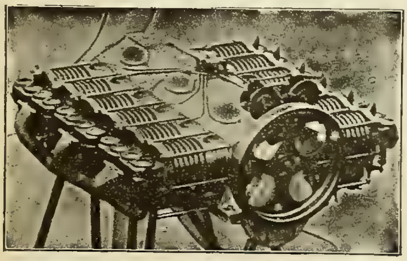

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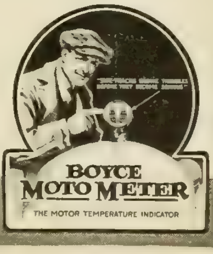

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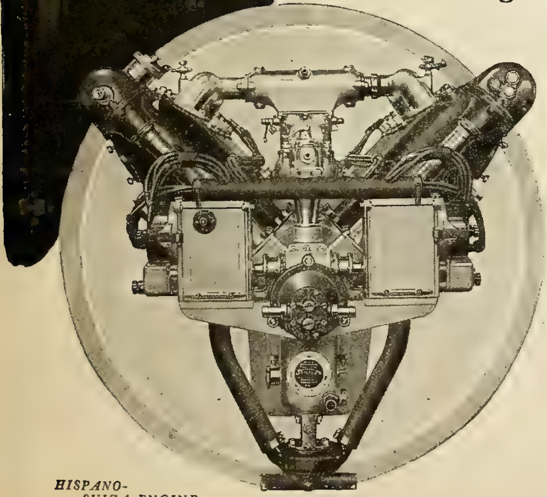

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WEEKLY

Vol. VII JULY 1, 1918 No. 16

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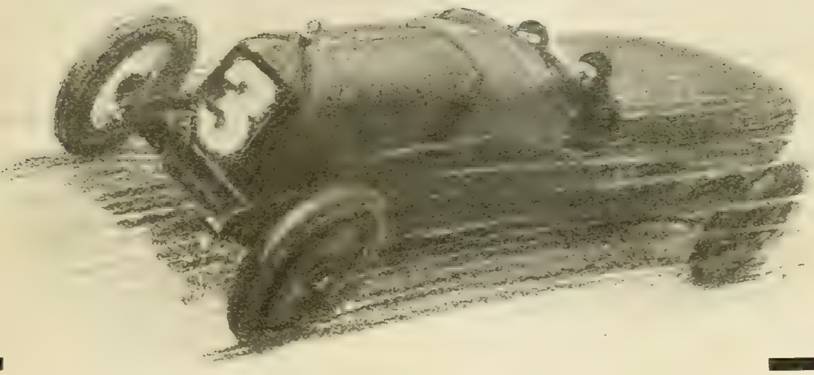

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TRANSATLANTIC FLIGHT THIS YEAR

Major-General Brancker Proposes Delivery of American War Planes to Allies Via Air

ON June 21st Major Gen. William Brancker of the British Royal Air Force, who is Controller General of British Air Equipment and a member of the new British Air Council, and who has just come to America to represent the British Air Council, said that the enterprise of a flight across the Atlantic should be undertaken as soon as possible and indicated his belief that it would be accomplished this year. General Brancker said he saw no reason why a large number of aeroplanes should not be sent over the Atlantic next year to be delivered under their own power, and thus meet part of the difficulty of ship shortage in the transportation of aeroplanes to the fighting front.

In response to questions whether he knew of any air pilots willing to undertake such a flight, General Brancker replied: "I have with me three British pilots who are willing to make the trial. You might say there are four that I know of, as I am myself willing to join in the trial. It is an enterprise that must be carried out as soon as possible. Once this has been established, America's output of big bombing machines can proceed to Europe by air, and so save the shipping that is so invaluable for other purposes. This may seem a wild statement, but we must remember that in 1914 the flight of the English Channel was considered a wonderful and dangerous performance. There is no reason why a considerable number of big aeroplanes and seaplanes should not cross the Atlantic during next Summer, and the sooner that a pioneer proves the flight not only to be possible but comparatively safe, the better can the wonderful resources of America be employed."

General Brancker expressed his conviction that such a flight could be made this year and that the most practicable route would be from Newfoundland to the Azores, then to Portugal and the British Isles or France. General Brancker said the British Government was considering the project seriously and endeavoring to bring about its accomplishment. General Brancker was asked whether the matter had been brought to the attention of the American Government, and replied in the affirmative.

Secretary Baker indicated his approval of what General Brancker had said in favor of attempting a transatlantic flight this year.

"It is a very daring and tempting speculation, and anything that the War Department can do to help to materialize it will be done," said the Secretary of War.

General Brancker expressed the hope that it would be a joint Anglo-American project, in which the personnel for the first voyage might be about evenly divided between the military air forces of the two nations. He said also that there should be about four passengers carried by the plane making the flight, an engineer, a navigator, and a relief of pilots.

General Brancker thought the enterprise could be carried through with motors of 750 horse power, capable of forty hour's flight. The motors should be capable, he said, of eighty-five miles an hour, and when favored by winds, the seaplane should have an added speed of ten to fifteen miles an hour. There were three main problems involved, he thought. These were engine reliability, navigation, and weather forecasting. Engine reliability, he said, would be all right. He was satisfied the Rolls-Royce motor would be able to do it this year, and that the Liberty motor should be able to do it next year. Navigation would be all right also he thought, but weather forecasting was the more important factor, as there was the possibility of the aviator running into bad weather far at sea. General Brancker said that the shortest route, and the one usually suggested, was that via Greenland to Ireland. But this was probably too foggy a route at many seasons. The second projected route was direct from Newfoundland to Ireland. This was a better air route, but would cross an uncertain weather area. The route via Newfoundland to the Azores, he thought, was much the better route for weather conditions. There is a high peak on the Azores that can be seen far at sea in good weather, and which would serve as a guide post to the air pilot. But there are difficulties in establishing an aerodrome for a good landing there, although if the flight was undertaken with aeroplanes fitted as seaplanes in the beginning they could land on the water at the Azores.

Aviation May End Warfare

"The progress of aviation during the last four years," said the General, "has been little short of marvelous, and there is no reason why its progress during the next four years should not be equally so; every day its importance as a factor toward ending the war increases, and it is a branch of warfare in which the Allies should be able to make far more rapid progress than the Germans, whose material resources are far more restricted and whose pilots can never be as good as ours in the air. In a few years the possibilities of aviation as an instrument of war are so appalling that it may force civilized nations, at all events in Europe, to agree to abandon war among themselves altogether. War has been the making of aviation; let us hope that aviation may be the destruction of war."

"America," he said, "has a wonderful opportunity of pushing the advantages of aerial supremacy to the utmost, but her manufacturers must realize that the progress of aviation has been very rapid and will be very rapid, and that, therefore, they must face continual interruption in standard production in order to produce aircraft of higher and higher quality and performance."

Aero Club Makes Negotiations Public

Following the announcement that Major Gen. William Brancker of the British Royal Air Force had come to this country to arrange for military aeroplane flights from this country to Europe, to pave the way for sending Amerian aircraft abroad on its own power, the Aero Club of America made public its negotiations with manufacturers to attempt an early transatlantic flight. One of the proposals of the Aero Club was made to William H. Workman, representing the Handley-Page machine, who accepted at once.

The Aero Club officials were surprised to find that the aeroplane manufacturer thought the matter of sending a plane across the ocean was so little outside of a day's work that he asked a bonus of only $2,500 outside of the cost of the machine for undertaking the trip from this country to Europe. The Aero Club had earlier found an indication that the opinion was general that the flight was sure to be accomplished without great delay when they made inquiries at Lloyd's in London as to their willingness to insure a prize of $150,000 which the club planned some months ago to offer for the first successful transatlantic flight. The reply was that Lloyd's was not prepared to make any bet against the flight being made.

The club submitted its plans for a flight to Lieutenant Belloni, who is in this country as a representative of the manufacturers of the Caproni. He was reported to have tentatively accepted the proposal, and is now preparing terms for the flight by Caproni.

The proposed transatlantic flight of the Curtiss aeroplane America was under preparation when the war started in 1914. Since they developments of aerial navigation devices, as well as the education of air pilots for successful over-water flights, has advanced so that the project presents few of the difficulties which it did in 1914. The most difficult problem that was considered as facing the pilot of the America on its proposed trip was that of keeping posted on his latitude and longitude and steering a course so as to avoid great deviations, which might cause him to run out of fuel while on his way to the Azores.

The matter of keeping to a course has been almost entirely solved by the invention of a radio receiving instrument by which it is possible to tell the exact direction from which radio waves are given forth. This has been adapted to aeroplanes, and an air navigator, with an instrument tuned to receive messages from a point in America and a point in Europe, would always be in possession of a fixed point to steer by.

Professor Charles Lane Poor, Professor of Celestial Mechanics at Columbia University, working on the problem at the request of the Aero Club, had invented a so-called "position line indicator," which simplifies some of the other problems of air navigators. The difficulty hitherto for an air pilot has been to make his calculations of position quickly enough to benefit him.

An air pilot who needed to know his distance from a given point, the direction of his flight, the angle of ascent or descent of his machine, his altitude, and other factors necessary in accurately correcting his course, has had to spend several minutes assembling these data separately. By the time they were assembled his machine might be ten or fifteen miles from where it was at the beginning of the calculation, so that the result was necessarily crude. Dr. Poor's instrument is an automatic calculator which finds out all the pilot needs to know about his position, and works out the problem mechanically.

The letter of Alan R. Hawley, President of the club, to Mr. Workman and to Lieutenant Belloni is as follows:

> As we stated to you before you went to England three months ago, a group of patriotic people, who were anxious to assist the Government in solving the difficult problems of delivering thousands of aeroplanes overseas and establishing a trans-Atlantic aerial patrol, has offered to order a large Handley Page aeroplane provided you can assume the responsibility of delivering the machine to England by air. Most people feel certain that aeroplanes could be delivered overseas by their own power, and at least three prominent aeronautic engineers and manufacturers have stated that they can produce the aeroplanes capable of flying across the Atlantic.
>
> But, while this belief and this certainty have existed for over a year, the authorities in charge of placing orders did not place orders for machines capable of flying across the Atlantic, and we are still exactly where we were a year ago. Nothing had been done, notwithstanding the fact that there is nothing to be lost and everything to be gained in placing orders for the largest machines obtainable.
>
> Even if they had not flown across the Atlantic, we would today have them to patrol for U-boats, hundreds of miles out at sea, preventing them from sinking our valuable ships and destroying lives and property. We would, in fact, be in a position to meet Germany's threat to declare the United States coast in the danger zone, with confidence that the U-boats would meet with defeat. The only way to make up, if possible, for the failure on the part of the past aircraft administration to act, is to go to it now without delay. Therefore, we would like to hear from you the terms under which you, representing Handley Page, would undertake to deliver one of the largest Handley Page machines to England, Ireland, or France. We would like you to give full details regarding the following points:
>
> (1) Will you take an order for a Handley Page machine, you to assume the responsibility of delivering it to Great Britain or France under its own power?
>
> (2) What will be the cost for such a machine?
>
> (3) How much bonus must we pay extra for you to assume the risk and responsibility of having it flown across the Atlantic and delivered by air.
>
> (4) We know that the life of an aeroplane is approximately 600 hours, and the life of motors, provided they are run throttled down, is approximately 500 hours, so that if the machine is flown most of the time under throttled power, the aeroplane will have had little wear and can be used for at least 400 hours more of flying after it has crossed the Atlantic. Can you guarantee that the flight can be made with the motors throttled down four-fifths of the time?
>
> (5) As, next to having the aeroplane, the most important factor is having two good pilots, may we inquire whether you have two suitable pilots? Who are they and has their experience been such that it is likely they would be successful in a flight across the Atlantic?
>
> (6) There are three likely routes for the trans-Atlantic flight—which do you consider most favorable for the first flight?
>
> (7) The entire importance of the demonstration rests on being able to do it again a thousand times within six months and ten thousand times within a year. In other words, would you and your associates be ready to take a large order for similar machines, and how soon could you produce after receiving the order. How many machines of this type could you deliver three months after receiving the order? What increase could you guarantee in production each month thereafter, provided an order is given for all that you can produce and there is no interference with the production and no change in the designs?
>
> (8) We appreciate, of course, that very large machines, like the Handley Page and the Caproni, do not grow old in design. They can always be used for bomb dropping at night, when they cannot be seen in the air, and they can carry on aerial operations against the enemy bases and railroads and can conduct a continuous campaign of destruction against the bridges on the Rhine, which are crossed daily by hundreds of trains loaded with German troops and munitions. If it were possible to wreck them and keep them wrecked, Germany would be unable to supply her forces in France and Belgium. Therefore, there should be no delay in building large machines—the larger the better. We have had too much delay in this respect, and the cause of the Allies is suffering therefrom.
>
> We also appreciate that, had we hundreds of large aeroplanes capable of flying 1,500 miles without stopping, the U-boats would not dare to attack to attack shipping along the American coast, or anywhere between the American coast and the Azores—in fact, anywhere, because these aeroplanes could strike at the U-boats everywhere. It is only a question of number. Our Allies have found that everything is possible with large aeroplanes, but they cannot get a sufficient number to cope with the situation. America has tremendous resources which are practically unused and untouched, and can produce thousands of these large aeroplanes.
>
> We will appreciate your answering this letter as fully and quickly as possible. Upon hearing from you we will consult with the authorities in Washington and secure from them the permission necessary to permit you to go ahead building these aeroplanes and to make the flight across the Atlantic at the earliest opportunity.

Six Ways to Cross Ocean

Henry Woodhouse, a Governor of the Aero Club, said that there were three routes for a transatlantic flight and six ways in which it could be attempted.

"The first," he said, "is by means of large aeroplanes capable of flying 3,000 miles from this country to Ireland without stopping. The construction of such planes is considered possible by prominent aeroplane manufacturers. These aeroplanes would fly at a great height and take advantage of the trade winds. Their speed would be about 100 miles an hour, and they could make the trip in about thirty hours.

"The second way would be by means of flying boats or hydroaeroplanes starting from New York and flying to Ireland, stopping to take fuel from ships every 300 miles along the route. These would be ships following their usual course across the Atlantic. The aeroplane pilot should know the route and approximate speed of the ships leaving the harbor, and the ships should expect a possible visit from an aeroplane,

"The third plan would be by land planes, large or small, starting from Newfoundland and flying to Ireland, a distance of 1,800 miles, without stopping. The constructiong of aeroplanes capable of doing this is considered easy by prominent manufacturers. These would also fly at high altitudes and would be assisted by the trade winds. Such a flight might be done under twenty hours.

"The fourth plan would be by flying boats or hydroaeroplanes starting from Newfoundland and flying to Ireland, 1,800 miles, taking on gasoline from ships at intervals of about 300 miles along the route.

"The fifth would be a flight by land aeroplanes, large or small, from Newfoundland to the Azores, 1,195 miles, and from the Azores to Portugal, 850 miles.

"The sixth would be by means of hydroareoplanes flying from Newfoundland to the Azores and from the Azores to Ireland, taking on fuel from ships 200 miles apart along the route."

In a statement issued by the Aero Club of America, regarding the plans for the proposed transatlanic flight, Mr. Alan R. Hawley, President of the Club, said:

"The plan to fly across the Atlantic has reached the practical stage of development where it is only a question of deciding which of the four types of available aeroplanes to use in the first flight.

The Aero Club of America officials agree in every way with the statements of Major General William Brancker regarding the feasibility of making the transatlantic flight this coming September.

General Brancker's Extensive Experience

Being Controller General of Air Equipment of the British Air Ministry and having been Deputy Director General of Military Aeronautics, and having had extensive practical experience in actual flying and training of aviators for the past two years, he knows what he is talking about. He knows the problems of flying across the Atlantic, the types of machines available in England, France and Italy to make the flight, and knows that there are scores of tried and tested aviators ready and anxious to make the flight.

Two of the four types of aeroplanes which can be used to make the flight are American made. One has been offered to the Aero Club by Captain James V. Martin the veteran aviator and aeroplane constructor, of Elyria, Ohio. Captain Martin, who is a master mariner and member of the United

States Naval Auxiliary Overseas Force has submitted a very scientifically worked out plan, proving by actual figuring why his aeroplane can fly across the Atlantic without stopping.

It is well to state here that plans of the Committee of the Aero Club which has had charge of developing the plans for the transatlantic flight for the past four years, show that there are seven different ways and five routes for the transatlantic flight. The Club has had plans submitted for every one of these plans and for each of the routes, and for every type of aircraft, lighter as well as heavier than air.

For obvious reasons the plan to fly across the Atlantic by using the southern route, from Pernambuco, Brazil, to Cape Verde, Africa, which is only about 2,000 miles, with the Island of St. Paul on the way, and the northern route by way of Labrador, Greenland, Iceland, Faroe Islands, to England, cannot be considered. In each case the flight over water is shorter than by the other routes, but they are not practical at present.

General Brancker points out that it is possible to make the flight by both seaplane and land aeroplane, but for the flight to the Azores he points out, very rightly, that the seaplane will be the best, because it can easily land on the water, while it would be difficult to establish a landing place for a land aeroplane.

The plan proposed by Handley Page is to cross the Atlantic with a large land aeroplane. This is also the plan of Caproni. But in each case, the British and Italian authorities also consider practical the plan to make the trans-Atlantic flight with a seaplane.

The American propositions to cross the Atlantic include a plan to do it with a seaplane of the flying boat type, and several with land aeroplanes.

Because all the propositions considered are good, Mr. Robert J. Collier, member of the Board of Governors of the Aero Club of America, who has been interested in plans to fly across the Atlantic for a number of years, proposes the very interesting plan of having the flights across the Atlantic by the representatives of the different countries take place simultaneously. This would afford a comparative test for the different types of aeroplanes employed, and would make it possible to come to conclusions as to which type is best. If the plans being considered were to be followed in such a test, the flights would be on the three routes mentioned above.

As the main purpose of the trans-Atlantic flight, as stated by General Brancker, is to show the practicability of delivering warplanes in large number from the United States to the Allies, and whereas both seaplanes and land aeroplanes are needed to insure aerial supremacy to the Allies, both on land and sea, everything is to be gained by testing every one of the plans submitted.

The Aero Club of America is co-operating closely with the Government authorities, and every one of the plans are referred to the Government authorities. The Club is only anxious to co-operate in getting this thing done, therefore it is willing to help the Government to do it, or if it would help the Government more to have the Club undertake the entire work, the Club is ready to do it.

THE NEWS OF THE WEEK

Aircraft Will Bomb City July 4

New York is to be bombarded from the air on Independence Day. Ten aeroplanes and two dirigibles will participate in the aerial programme.

While the gigantic loyalty parade arranged by the committee is moving along its designated route the aeroplanes will soar above, dropping copies of "The Star Spangled Banner." In all one million copies will be distributed in this novel fashion from Washington Square north to Seventy-second street.

Rome Gives Ovation to American Flyers

Rome.—American airmen who have been trained in Italian camps and are now starting with Congressman La Guardia to the Italian front were received here with enormous enthusiasm as they marched through.

Other contingents of American aviators will shortly follow the first escadrille.

Britain and France to Buy Liberty Motors

Washington.—Official dispatches from London state that the British Government has given the American Liberty motor every test possible except that of continued operation in the field, and that it passed the tests excellently, the British authorities being highly gratified as well as satisfied.

Great Britain will purchase, it was stated, a large number of the engines, her capacity for turning out 'planes being greater than that for building engines, and the same situation exists in France, which also will receive a large number of the Liberty motors from the United States.

Curtiss Establishes "Square Deal" Department

The Curtiss Aeroplane & Motor Corporation has taken a long stride forward in the development of industrial morale by the establishment of a "Square Deal" department in the Division of Education and Welfare.

The "Square Deal" department is for the benefit of all Curtiss employees, whether in factory or office. Its purpose is to apply the square deal to all employees and to the company itself by removing the causes of any dissatisfaction that may arise, and by placing employees in the position for which they are best fitted.

Any employee who feels that he or she has been unjustly dismissed, overlooked in promotions, assigned to duties for which they are not best fitted, neglected in wage advances or made the victim, real or imagined, of favoritism by foreman or superintendent, may bring complaint to the "Square Deal" department. An investigation is made immediately.

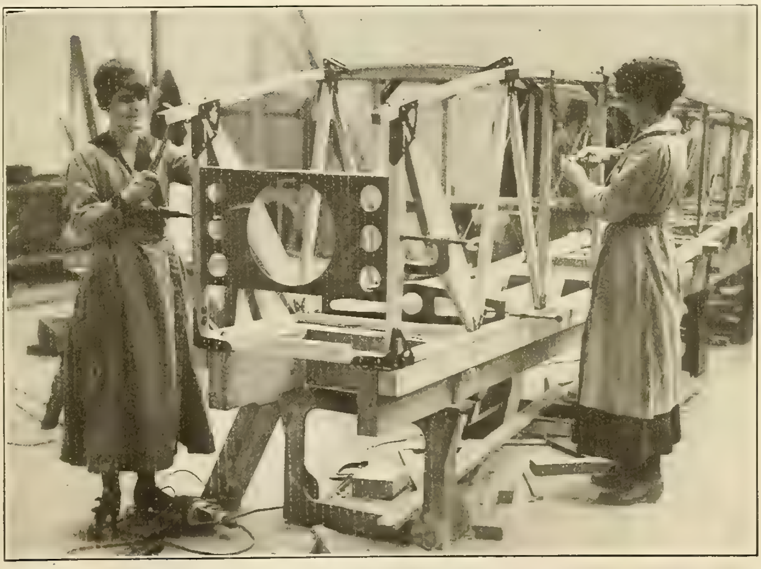
In effect, the "Square Deal" department is a court of appeals. No man or woman may leave the organization, either their dismissal or desire to quit until the "Square Deal" department has reviewed the case.

Disagreements, misunderstandings, complaints of favoritism, and ordinary dissatisfaction result under the old system in a heavy labor turnover. Companies frequently lose workers with capacities which could efficiently be used in some other department. The Curtiss "Square Deal" department thus serves the company no less than the worker through this extension of welfare activities.

May Reduce Rates of Postage for Air Mail

Because of the success of the aeroplane mail service and the fact that the capacity of the aeroplanes is not fully utilized, a reduction of aeroplane postage rates is under consideration.

Mr. Burleson, Postmaster General, announced that as soon as new regulations could be prepared the postage for aeroplane mail service between Washington, Philadelphia and New York would be reduced to sixteen cents for the first two ounces and eight cents for each additional ounce. He said also that the service had proved so successful that it would soon be extended to Boston.



© Central News

In the British aeroplane factories many women are employed. Here are two trueing up an aeroplane fuselage

Attorney General Takes Step to End Contract-Fee Giving

Attorney General Gregory, June 18, sent to members of the Cabinet, heads of bureaus, and other governmental agencies letting contracts for Government work, the following letter:

"A situation which has arisen in the matter of Government contracts seems to me to require summary action. Owing to the tremendous increase in Government business and the speed with which it must be executed, some manufacturers, because of ignorance or misinformation, have thought it necessary to negotiate with the Government through contract brokers or contingent-fee operators.

Condemned by the Courts

"It follows that the system requires a contractor in making his estimate to load his bid with the contingent-fee item. The courts have universally condemned the contingent-fee contract. The methods employed by the contingent-fee operator are often insidious and reprehensible, and in view of the fact that the average fee is 5 per cent, the resulting cost to the Government is very great:

Step to Break Up Practice

"As a means of breaking up this practice, I have prepared the following form of covenant, which the President requests shall be inserted in all Government contracts:

" 'The contractor expressly warrants that he has employed no third person to solicit or obtain this contract in his behalf, or to cause or procure the same to be obtained upon compensation in any way contingent, in whole or in part, upon such procurement; and that he has not paid, or promised or agreed to pay, to any third person, in consideration of such procurement, or in compensation for services in connection therewith, any brokerage, commission, or percentage upon the amount receivable by him hereunder; and that he has not, in estimating the contract price demanded by him, included any sum by reason of any such brokerage, commission, or percentage; and that all moneys payable to him hereunder are free from obligation to any other person for services rendered, or supposed to have been rendered, in the procurement of this contract. He further agrees that any breach of this warranty shall constitute adequate cause for the annulment of this contract by the United States, and that the United States may retain to its own use from any sums due or to become due thereunder an amount equal to any brokerage, commission, or percentage so paid or agreed to be paid.'

"As an additional protection it is requested that your department adopt as a regulation the following language taken from section 3722, page 735, Revised Statutes, as applied to the Navy Department: 'And no person shall be received as a contractor who is not a manufacturer of or regular dealer in the articles which he offers to supply.' This will synchronize the action of officials of your department with that of the contractor who is prohibited by section 3737, Revised Statutes, from transferring his contract or order, or any interest therein, to any other party.

"T. W. GREGORY,
"Attorney General."

Review of Aerial Mail Service Operations for First Month

The Post Office Department authorizes the following:

"In the first month's operation of the Aerial Mail Service between New York, Philadelphia and Washington, a total of 5⅖ tons of letter mail was transported. The planes carrying mail covered 11,109 miles and had a total of 157 hours 59 minutes in the air. The average speed through storm and fair weather for the month was slightly in excess of 70 miles an hour. Twenty-one out of 26 flights were completed at Belmont before 4 o'clock in the afternoon, 12 of them being between 2.30 and 3 o'clock.

"Lieut. Edgerton has to his credit 20 perfect flights of 130 miles, never having to make a stop en route, and without damaging a plane. Lieut. Culver, flying between New York and Philadelphia, has 13 perfect flights to his credit, never having to stop en route, and having no damage to his plane. Lieut. Webb has 11 perfect flights to his credit. Lieut. Kilgore made 9 non-stop flights and 2 interrupted flights. Lieut. Bonsal made 15 non-stop and 4 interrupted flights, and 1 damaged plane. Lieut. Miller made 11 non-stop flights, 4 interrupted flights, and 2 planes damaged.

American Airmen in France

The following official dispatch from General Pershing was given out on June 20th.

"Last night our aviators were again successful in bombing the railroad yard tracks at Confans."

Ace of Aces Missing

According to a press report of June 20th, Lieut. Frank Baylies, the American Ace of Aces, has been brought down behind the German lines. The last seen of him was when his comrades saw him "peaking to earth with smoke streaming in his wake." One of the Observation Balloons afterward reported that though the plane was on fire, it seemed to flatten out before it touched the ground. There is, therefore, hope that he escaped with his life, although he is a prisoner.

Lieut. G. T. Rowe Missing

Nothing has been heard of Lieut. G. T. Rowe, of the U. S. Air Service since May 30th. He was then seen to descend to the surface of the North Sea for repairs to his engine. Later a carrier pigeon returned from him saying that he had been attacked by three German machines.

Compilations show that the American aviators flying over the Toul sector have made an enviable record. American pursuit units since April 14, when they started operations, have shot down at least thirty-two enemy aeroplanes. Seventeen of this number were seen and officially confirmed by the French, while during the same period only seven of our chaser flyers have been lost.

Of the seven American pursuit pilots who were lost, four were killed—one by accident and two are prisoners in the hands of the Germans.

The Americanized Lafayette Escadrille, which is still attached to the French army, has again covered itself with glory. Particularly has this been the case over the blood soaked slopes of Mount Kemmel.

Nearly every pilot has been decorated by the French, British or Americans, and those already having medals received additional citations entitling them to stars or palms or bars.

Major William Thaw worked indefatigably, downing his fifth enemy aeroplane, thus becoming an "ace" and receiving his fifth palm of the Croix de Guerre.

George Turnure, of Lenox, Mass., now has two palms of the Croix de Guerre for shooting down in flames two German captive balloons behind Kemmel.

Hobey Baker got the Croix de Guerre for bringing down a single seater monoplane within the German lines.

Cord Myer, of New York, also was decorated for daring combat work.

Seth Low received the Croix de Guerre for the part he played in the same engagement, beyond Kemmel.

Monk Hunter, of Nashville, Tenn., was decorated for attacking a two-seater.

Christopher Ford, of New York, shot down in flames a single seater near Ypres, receiving the palm of Croix de Guerre.

Charles H. Biddle, of Philadelphia, attacked an armored two-seater, but was wounded in the leg, while another bullet passed through the motor. He landed in No Man's Land, in the region of Dickebush Lake, escaping from the wreckage of his machine just a minute before the Germans began to pulverize it with their artillery. He received the Croix de Guerre.

Ernest Giroux, of Boston, who has been missing since May 23, drove down out of control a German machine two days previously, and for this he has been cited for the War Cross.

William Dugan, of Boston, after being missed for several hours, returned after chasing a German machine beyond Lille. He has received the palm of the War Cross

Robert Rockwell, of Cincinnati, fought several German machines, driving one down out of control. He receives the third palm of the War Cross.

Dudley Hill, of Peekskill, N. Y., drove off German machines that were attacking a British observation balloon and later brought down a low flying armored German plane which contained three occupants. He receives the fourth palm of the War Cross.

2 American Airmen Honored in France

Paris.—Captain David McKay Peterson, of Honesdale, Pa., and Captain Kenneth Marr, of San Francisco, have been honored for their recent air victories.

They have just been appointed to the rank of commander of a squadron of American aeroplanes.

More Records Established

Paris.—The French aviators Helaldy and Lorgenat flew with a seaplane carrying 660 pounds of cargo from Paris to London in two hours and forty-five minutes on June 10. The return journey was made in ten minutes less. These are record flights. A regular aerial mail service between the two capitals is expected soon.

Aiding in Aeronautical Work

Suitable sites for additional aerological stations for the observation, measurement, and investigation of atmospheric phenomena in the aid of aeronautics have been selected by the Weather Bureau at Broken Arrow, Okla.; Ellendale, N. Dak.; Groesbeck, Tex.; Leesburg, Ga.; and Royal Center, Ind. This was done under the Army appropriation act for the year ending June 30, 1918, authorizing $100,000 for this purpose. Installation of equipment has been completed at the Ellendale station and daily free air observations are being obtained. It is expected that free air observations will be begun at the other four stations about July 1.

Aerial Gunnery School

Gerstner Field, Lake Charles, La.—The many aviation students from New York City and vicinity now training here are fast completing their course in aerial gunnery.

This "finishing school," as it is called, is the first of its kind in the United States, and aviators from all over the country are here for the training course.

The students easily discern the striking of bullets on the water and are able to correct their fire almost instantly if the shots go wide. The results, instructors say, are more than gratifying.

Before being sent to the camp the students are required to undergo a course of ground

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One of the powerful sirens on the roof of one of New York's high buildings that will send forth shrill warnings should German aeroplanes succeed in reaching the metropolis

schooling near here. From Gerstner Field they go to the lake, and in classes of thirty are put to work on the "Taube" and a small aerial target released at an altitude of about 3,000 feet. The students are graded according to their proficiency in firing, and when they make the percentage of hits required are discharged from the school.

Anti-Aircraft Guns for City

Washington.—That the possibilities of German submarines carrying seaplanes reaching American waters are recognized by the War Department became known when it was disclosed that the House appropriations committee is giving consideration to defense against possible raids by air.

The sub-committee, among other things, is considering estimates submitted by the War Department for a large number of anti-aircraft guns of the 4.7-inch type. The plan is to establish such guns at points along the Atlantic coast where they might be useful in repelling air raids.

From the Flying Fields

Kelly Field's big stadium and athletic field will be dedicated July 4 when athletes from 22 camps in the Southern Department will compete in a monster track and field meet.

The stadium will have a seating capacity of 20,000 persons. The site is a 25 acre tract of land, the gift of D. J. Allen of San Antonio, Texas. The structure will be oval, surrounding the field, and will be built in movable wooden sections. Next month a swimming tank will be constructed, tennis courts built, and outdoor athletic paraphernalia installed.

An excellent quarter of a mile cinder track, inside of which are two baseball diamonds have been laid out. The work of construction is well under way and will be completed before the day of the meet. Approval for the project is expected from Washington.

Wireless News to be Received at Kelly Field

The news of the day is to be supplied to the officers and men of Kelly Field by wireless.

Lieut. K. M. Manookin, head of the radio school of the Kelly Field Flying Department, announces that news bulletins and weather reports are to be received daily at the new radio station. These reports will be posted on bulletin boards all over the field. They will come from every wireless station within the radius of the Kelly Field station.

Must Use Clothes U. S. Prescribed

Washington.—Use of the standard cloths prescribed by the Quartermaster's Department for officers' uniforms will be compulsory, irrespective of whether the officers have the uniforms made through the department or by private tailors, it was authoritatively stated at the War Department on June 17th.

There will be nothing to prevent the officers having their uniforms cut by their own tailors; but they will be compelled to confine themselves to the standard cloths prescribed by the department.

Naval Aviator Does 109 Straight Loops

Looping 109 successive times with a hydroplane at the Marine Flying School, Miami, Fla., Lieut. F. L. Fleer established on June 7 what is probably a new naval record. There are instances where military fliers looped more than 100 times, but Lieut. Fleer, it is believed, is the first to do it with a hydroaeroplane.

Machine Tests "Rebreathing" of Air Cadets

Ft. Worth, Texas.—By a "rebreathing machine," the first of its kind to be established by the United States Government or any of its Allies anywhere, aviators flying under the Stars and Stripes henceforth will be classified according to their ability to thrive in high altitudes.

The machine is in a research laboratory at Barron aviation field, and is in charge of Lieutenant G. H. Hanson, F. W. Thomas and James Blair. It produces all the sensations of ascending and descending, and has been in use by the German air service, it is said, for five years.

Henceforth no pilot from any of the local fields will be assigned to active duty overseas until he has passed the tests of the contrivance and been classified according to his ability to withstand altitude fatigue.

The pilots will be divided into three classes. In the first class will be placed airmen who are never affected by altitude fatigue and who can ascend and fight anywhere their planes will mount.

In the next class will be those whose mental faculties are dulled by high altitude.

In the last, or third, will be those who faint under the stress.

Captain D. McK. Peterson, a young Princeton graduate, who is giving an excellent account of himself with the American Air Service in France

To Train Carrier Pigeons

Kelly Field, San Antonio, Texas, has commenced the training of carrier pigeons. One hundred and fifty birds have been received to start with. They will be taken up in aeroplanes and, after messages have been attached, they will be thrown from the machine. They will be trained gradually to return to their specially constructed loft where when a bird enters, a bell rings. The flight of each bird will be timed and only those which show ability to fly straight home will be kept for breeding purposes.

The training will be in charge of Sergeant Oscar A. P. DeVaux, 615th Aero squadron, who acted as the head of this branch for the Belgians at the beginning of the war. Lieutenant W. C. Couch, assistant-adjutant, will supervise the training.

Chanute Field News

Reveille hour has been changed so that now the occupants of Chanute Field tumble out of bed at four thirty A.M., and the flying starts at 5:50. The teaching of formation flying has been started. The Bloomington Chamber of Commerce has constructed a flying field close to the city for the fliers from Chanute Field to use. They have erected a flagpole in the center of a fifteen foot circle to show the direction of the ground wind. The circle is easily visible at 1,500 feet up. Under the recent order of the Director of Military Aeronautics the non-flying officers of the Field are being taught to fly.

Lewis Gun First

London.—In the House of Commons J. I. MacPherson, Under-Secretary of the War Office, reported for the committee appointed to test various machine guns. He said the committee had placed the various guns examined in the following order:

First, Lewis.
Second, Light Hotchkiss.
Third, Madsden.

The decision was unanimous.

American Airmen in France

A despatch from the Headquarters of the Italian Army dated June 23 says: Lieutenant Clarence Young, of the American Aviation Forces, while making a flight was compelled to descend within the Austrian lines. His comrades who saw him make the landing assure Headquarters that he was not injured.

According to *La Liberte,* American aviators on the night of June 22-23 carried out an aerial raid on German territory, when they bombed Metz-Sablons station and started a big fire.

Moving Pictures from Aeroplane

The Rivoli Theater on June 23 introduced a new form of bill when it gave a number of reels showing the American aviators training at Miami, Fla. These became thrilling when there was shown a series taken by Q. M. S. John M. La Monde, U. S. M. C. These pictures were taken while the aeroplane in which the camera was mounted did a series of loops, sideslips and nosedives.

French "Ace" Ends Flight from Canada

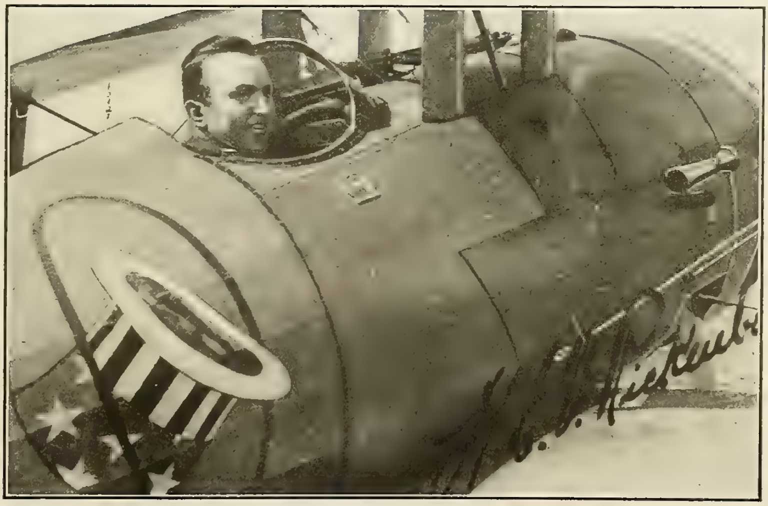
Lieutenant Georges Flachaire, the French "Ace," who left Montreal, Canada, on June 19, arrived at Cleveland on Sunday night, June 23. He made two stops, one at Buffalo of two days, and one at Erie for one day.

Lawn Fête for Aviators' Athletic Fund

A lawn fête will be held on July 6 at Mr. Mortimer L. Schiff's country home, Oyster Bay, Long Island, for the purpose of raising funds to provide athletic equipment for the training stations of aviators. One hundred and fifty aviators are expected to be present. The fête will be followed by a dance. The visiting aviators will be entertained for dinner at numerous nearby country homes and then motored back for the dance. Mrs. Charles A. Van Rensseler is in charge of the arrangements. Mrs. Edward McKenna is chairman of entertainment. Other women interested in the entertainment are: Mrs. Thos. Hitchcock, Mrs. John S. Phipps, Mrs. Henry H. Duryea, Mrs. Patrick A. Valentine, Mrs. John Willys, Mrs. French Vanderbilt, Mrs. Charles S. Whitman, Mrs. E. Henry Harriman, Mrs. William E. Benjamin, Mrs. Horatio N. Slater and Mrs. Marshall Russell.

Ten New Flying Fields for Long Island

Mineola, L. I.—Because of the limited space open for landings on the flying field here, the Government will establish ten new aviation training stations in different sections of Long Island.



Eddie Rickenbacher ready for a flight in pursuit of Boches, which he seems to be able to outwit in excellent fashion © Western Newspaper Union

The AIRCRAFT TRADE REVIEW

N. E. J.

Gasoline Tax Rumors Untrue

Washington.—Reports that a high tax on gasoline used for passenger cars and motor trucks will be placed in effect in July or August, 1918, are untrue. These reports, published by papers throughout the country, are the result of a speech made in Congress advocating such a tax. There has been no bill prepared for it.

To Increase Spruce Production

Washington Production of spruce for aeroplanes will be increased by the addition of 9,000 workers to the present ranks. Provost Marshal Crowder sent out a call for 9,000 limited service men of draft age. These men will be sent to the Northwest.

Big Liberty Plane Production in Detroit

Detroit.—Detroit is producing 92½ per cent of all Liberty engines contracted for and at least one-third of the battle plane supply, according to a statement issued by the Detroit Real Estate Board. It is estimated that 19,000 Liberty engines will be completed in Detroit before Sept. 1, the contract time. It is also estimated that within 4 months Detroit will be producing not less than 50 complete battle planes daily

May Stabilize Oil Price

Washington.—Measures to stabilize the price of crude oil may be adopted by the Oil Division of the Fuel Administration. Mark L. Requa, Oil Director, has asked the national petroleum war service committee to co-operate with him in the development of a plan which will stimulate maximum production and give reasonable earnings.

The Fuel Administration authorizes publication of the following:

"Owing largely to the press reports regarding the action of the War Industries Board in taking over the entire steel production of the country for Government requirements and not making clear the point that the term 'Government requirements' included all essential requirements not ordered directly by the Government for Government use, a wrong impression has been created in the minds of consumers, such as oil producers, for instance, and they seem to think that the action of the War Trade Board is going to have the effect of curtailing and even shutting off completely the supply of these essentials, and this has resulted in more or less of a scramble to cover their requirements on orders in excess of their real needs and also in the hoarding of materials, which, in its turn, results in inequitable distribution and profiteering in price.

"The effect of the action of the War Industries Board should be exactly opposite. The taking over of the steel production by the Government and the allocation of that tonnage to essential industries only is calculated to increase greatly the supply of essential products, and, of course, the production of oil and gas and of all kinds of oil well supplies used in that production or in the pipe line transportation of same has already been classed by the War Trade Board as highly essential to the Government program in the prosecution of the war; therefore, their action is going to be a very great assistance in immediately relieving the shortage that has existed in a few items, such as wire rope, tubular goods and boilers.

"At the same time is should be thoroughly understood that every pound of steel or other essential commodity that is diverted from use in the building of ships, aeroplanes, and munitions has a proportionately retarding effect upon the completion of the Government's program, and therefore no truly patriotic citizen will consume these valuable commodities wastefully."

U. S. A. Steel Propeller

The American National Advisory Committee on Aeronautics is inviting engineers to give their attention to the question of producing a steel air-screw of variable pitch. The first requisite is for a propeller which will enable an engine to maintain constant speed at all altitudes, while the second requisite is that the air-screw be constructed of steel, because it is believed that this will be the ultimate material for propellers. Designs, photographs, and brief descriptions should be sent to the National Advisory Committee for Aeronautics, Munsey Building, Washington, D. C.

New Mechanics Handbook

Fred H. Colvin has just completed his "Aircraft Mechanics' Handbook" of 402 pages and 193 illustrations.

This book represents what the author believes to be the best practice known at this time in the aeroplane industry and contains many suggestions which are valuable to the aircraft mechanic. The purpose of the book is to make the facts available to the aircraft mechanic and inspector in the shortest time.

The first part of the book deals with the construction of the aeroplane and its theory. One chapter is devoted to the S. A. E. aeroplane standards. The materials that go into the aeroplane are discussed. The author gives several chapters to detailed description operation and characteristics of various types of engines. Following this is a chapter on notes and instructions to Government inspectors of aeroplanes and aeroplane engines. Specifications describing the design, construction, equipment and requirements, of a military aeroplane adapted to advanced school instruction in land flying are included. The details, dimensions and the method of assembly of training planes follow. A long and interesting section describes the methods of training used at Camp Borden, Ontario, Canada. It also includes a description of the camp. The instruments and accessories such as the tachometer, clinometer, banking indicator and Lewis machine gun are taken up carefully. The last two sections are composed of useful tables, diagrams and terms used in aeronautics. This book can be secured at the Aeronautic Library, 280 Madison Ave. Price, $3.20 postpaid.

Balloon for Propaganda Distribution in Germany Gets Tryout at Omaha

Omaha, Neb.—Colonel Hersey, commander at Ft. Omaha Balloon School, stated that the first flight of a new balloon to be used in spreading propaganda in Germany was a success. The balloon is equipped with a clock device to distribute circulars. The first balloon was sent away June 6 and distributed Red Cross circulars all the way to Elmo, Mo.

Colonel Hersey said more tests will be made before the balloons are sent to do their work of "peddling the truth" to Germans.

Templeton Director of Industrial District

Detroit.—Allan A. Templeton, former president of the Detroit Board of Commerce, and president of the Detroit Seamless Steel Tubes Co., has been made director of the Detroit industrial zone. He will have general supervision of the production of war materials in this zone. Detroit is the center of one of the 20 zones into which the United States has been divided by the War Industries Board, for the purpose of facilitating the manufacture of munitions. The limits of the Detroit zone have not been announced.

Personal Pars

Archer A. Landon, vice-president of the American Radiator Co. and well known in the manufacturing world, is now head of the Production Division of the Aircraft Production Board. More than 20 years ago he joined the American Radiator Co. as a machinist and after a few years was appointed manager of the smaller plants. Later on his promotions made him assistant general superintendent of plants. Three years ago Mr. Landon was elected vice-president of the company in charge of production.

F. B. Stearns, chairman of the board of directors of the F. B. Stearns Co., is president and treasurer of the Stearns Aero Parts Co., recently organized in Cleveland, O.

Motor truck and aeroplane trailer at one of the French aviation centers
(French Official Photo)

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NATIONAL ADVISORY COMMITTEE PRESENTS THIRD ANNUAL REPORT

THE third annual report of the National Advisory Committee for Aeronautics, reviewing the activities, and embodying much of the scientific work of the committee to June 30, 1917, has just been made public. It includes a message of the President announcing the transmission of the report for the consideration of Congress. The President states that the estimates of the committee, together with its plans to enlarge facilities contemplated through its laboratories and scientific staff at Langley Field, outlined in the closing paragraph of the report, have his hearty approval.

The report reviews the activities of the committee during the past year, the work accomplished in the study of scientific problems, the assistance rendered by the committee in connection with aerial preparedness for war, and in the development of the aircraft industry to meet the demands of the Government, and contains a statement of expenditures, estimates for the fiscal year 1919, and certain recommendations for the consideration of Congress. Technical reports covering the various subjects under investigation during the past year are submitted as appendices.

The National Advisory Committee for Aeronautics was established by Congress by an act approved March 3, 1915. Under the law, the committee is charged with the supervision and direction of the scientific study of the problems of flight, with a view to their practical solution, the determination of the problems which should be experimentally attacked, their investigation and application to practical aeronautics. The committee is also authorized to direct and conduct researches and experiments in aeronautics in such laboratory or laboratories as may be placed under its direction.

Personnel of the Committee

The committee has twelve members, appointed by the President. As authorized by Congress, the personnel of the committee consists of two members from the War Department, from the office in charge of Military Aeronautics; two members from the Navy Department, from the office in charge of Naval Aeronautics; a representative each of the Smithsonian Institution, of the United States Weather Bureau, of the United States Bureau of Standards, and not more than five additional persons acquainted with the needs of the aeronautical science, either civil or military, or skilled in aeronautical engineering or familiar with the allied sciences.

During the past year the two naval members of the committee, Capt. Marks L. Briston, U. S. N., and Naval Constructor Holden C. Richards, U. S. N., resigned on account of transfer to duty away from Washington, and Brig.-Gen. Geo. C. Scriven, U. S. A., resigned on account of retirement. To fill the vacancies thus occasioned the President appointed the following members: Rear Admiral D. W. Taylor, chief constructor, U. S. N.; Lieut.-Com. J. H. Powers, U. S. N.; Lieut. Carter V. E. Clark, Signal Corps. Dr. S. W. Stratton succeeded Naval Constructor Richardson as secretary. The annual meetings of the Advisory Committee are held in October and the semi-annual meetings in April.

For carrying out the work of the Advisory Committee the regulations provide for the election annually of an executive committee to consist of seven members. The executive committee, as organized on Oct. 9, 1917, is as follows:

Dr. Charles D. Walcott, chairman, secretary Smithsonian Institution.

Dr. S. W. Stratton, secretary, director Bureau of Standards.

Dr. Jos. S. Ames, Physicist, Johns Hopkins University.

Prof. Charles S. Marvin, chief U. S. Weather Bureau.

Dr. Michael I. Pupin, physicist and electrical engineer, Columbia University.

Maj.-Gen. Geo. O. Squier, chief signal officer U. S. Army.

Rear Admiral D. W. Taylor, chief constructor U. S. Navy.

Dr. W. S. Durand, chairman National Advisory Committee for Aeronautics, additional member.

The executive committee held monthly meetings throughout the year, and thirteen special meetings in addition.

Great Variety of Work

A good idea of the variety of the work that is being carried on by the committee may be obtained from the following list of sub-committees. It should be pointed out that the membership of sub-committees is not limited to members of the advisory committee:

Aerial Mail Service, Maj.-Gen. Geo. O. Squier, chairman; Aerial Torpedoes, Lieut.-Com. J. H. Powers, chairman; Aircraft Communication, Dr. Michael I. Pupin; Aeroplane Mapping Committee, Maj.-Gen. Geo. O. Squier, chairman; Bibliography of Aeronautics, Prof. Charles F. Marvin, chairman; Buildings, Laboratories and Equipments, Dr. S. W. Stratton, chairman; Civil Aero Transport, Dr. W. S. Durand, chairman; Design, Construction and Navigation of Aircraft, Maj.-Gen. Geo. O. Squier, chairman; Aeronautic Instruments, Dr. Jos. S. Ames, chairman; Editorial, Dr. Jos. S. Ames, chairman; Foreign Representation, Dr. Chas. D. Walcott, chairman; Free Flight Tests, Prof. John F. Sayford, chairman; Governmental Relations, Dr. Chas. D. Walcott, chairman; Helicopter of Direct Lift Aircraft, Dr. W. S. Durand, chairman; Nomenclature for Aeronautics, Dr. Jos. S. Ames, chairmen; Patents, Dr. Chas. D. Walcott, chairman; Policy, Prof. John F. Sayford; Power Plant, Dr. S. W. Stratton, chairman; Quarters, Dr. S. W. Stratton, chairman; Radiator Design, Naval Constructor H. D. Richardson, chairman; Relation of Topography to Aeronautics, Prof. Chas. F. Marvin, chairman; Sites for Experimental Fields, Dr. Chas. D. Walcott, chairman; Special Committee on Engineering Problems, Dr. W. S. Durand, chairman; Investigation of Materials, Dr. S. W. Stratton, chairman; Light Alloys, Dr. G. K. Burgess, chairman; Steel Construction for Aircraft, Dr. W. S. Durand, chairman.

Office and headquarters of the committee are located in rooms 515-519 Munsey Building, Washington, D. C. Its technical work is carried out in various laboratories and shops belonging to the Government and to universities. To carry out the highly scientific and special investigations contemplated in the act establishing the committee the latter has contracted for a research laboratory to be erected on the Signal Corps Experimental Station, Langley Field, Hampton, Va. This will be a two-story, red brick building, 126 x 52 ft. in dimensions. Among the departments of the laboratory will be a machine shop with structural testing laboratory, pattern shop, executive offices, drafting rooms, photographic, physical and chemical laboratories. There is also room for two wind tunnels which are contemplated for the near future, and engine-test sheds will be erected in a convenient location.

Situation First Reviewed in March, 1917

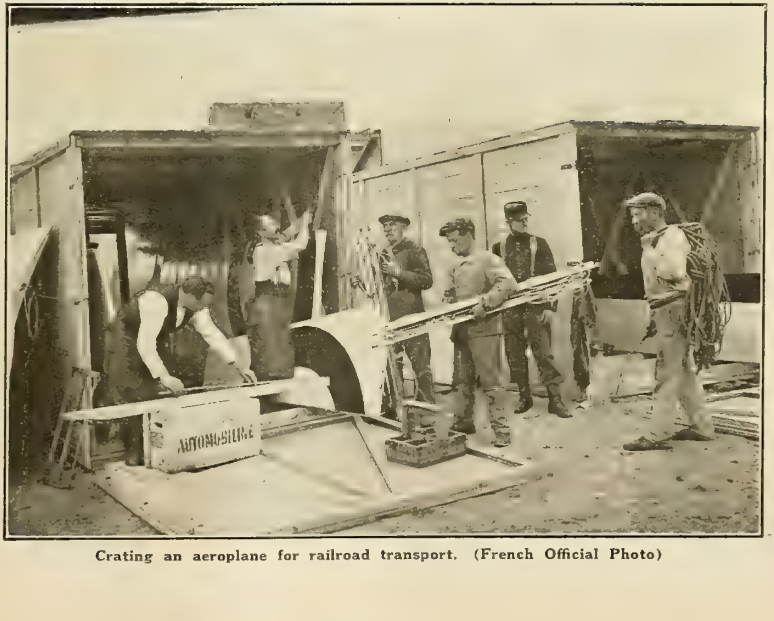
In the latter part of March, 1917, when war with Germany seemed imminent, the committee reviewed the condition of the aeronautic industry, the facilities then existing in this country for meeting the requirements of the Government, the possibilities of adequate expansion, and the then patent situation and its influence on the aeronautic industry. A sub-committee was appointed to co-operate with representatives of aircraft manufacturers and to investigate all problems relating to quantity production of aircraft for the Government. After careful study, the Advisory Committee submitted recommendations to the War and Navy Departments for increasing production and for the adoption of a program covering the next three years.

Early in April the chairman of the Executive Committee recommended to the Council of National Defense the appointment of an Aircraft Production Board, whose duties would be to consider and deal with problems arising in connection with quantity production of aircraft. The committee had previously undertaken a census of the production facilities of manufacturers of aircraft and aeronautic instruments, and this information was made available to the Aircraft Production Board. Another recommendation made was the appointment of a joint technical committee of the army and navy for determining specifications and methods of inspection for all aircraft requirements for the two services.

The committee took the initiative in organizing ground schools for the preliminary training of aviators and in determining the curriculum and methods of carrying on this instruction. A special commission was sent to Canada to study the methods of training at the Camp Borden Military School of Aeronautics at Toronto. On recommendation of the committee the War Department selected the following six colleges for the establishment of ground-school training in aeronautics: Massachusetts Institute of Technology, Cornell University, Ohio State University, Illinois University, University of Texas and University of California. Later, Princeton University and Georgia School of Technology were added. In May, 1917, the committee suggested that flying fields be named in commemoration of individuals who had rendered conspicuous service or contributed to the development of aeronautics, and that aviation schools established in Dayton, Ohio, Champaign, Ill., and Detroit, Mich., be named in honor of Wilbur Wright, Octave Chanute and Lieutenant Selfridge respectively. In response to requests from the War Department the executive committee gave it as its opinion that all parties and Governmental agencies connected with the development of the air service were co-operating in an efficient manner, and that nothing would be gained by the establishment of a Department of Aeronautics. It was on the recommendation of the committee that the Manufacturers' Aircraft Association was formed early in 1917. In March, 1917, Dr. J. S. Ames, a member of the committee, was delegated to accompany the National Research Council on its trip abroad, with the object of obtaining detail information on scientific matters relative to the war.

In order to further develop contact with the service of information abroad several members of the British Royal Flying Corps and the French Air Service were appointed associate members. The committee also co-operated with the War Department in bringing sample forms of aeroplanes from Europe for use in developing new designs here.

(*Continued on page 796*)



Crating an aeroplane for railroad transport. (French Official Photo)

AERONAUTICS DOMINATE S. A. E. SUMMER MEETING

Engineers at Dayton Devote Major Part of Time to Discussion of Aeroplanes, Aero Engines, and the Aircraft Program

THE Summer Meeting of the Society of Automotive Engineers, held at Dayton, June 17-18, proved conclusively that the questions receiving major attention at the present time are aeronautical. Nearly three-quarters of the big convention pavilion in the midst of the 450-acre park was filled with aeroplanes, engines, parts of wings, etc. There were 1,200 members and guests in attendance, and all were enthusiastic about the arrangements and program. A general idea of the latter may be had from the following schedule:

Saturday, June 15:

- 10:00 A.M. Meeting of eight divisions of Standards Committee at Dayton Engineers Club.

Sunday, June 16

- 10.00 A.M. Meeting Standards Committee, Dayton Engineers Club.
- 1:00 P.M. Meeting S. A. E. Council, Dayton Engineers Club.
- 8:00 P.M. Section Conference, Dayton Engineers Club

Monday, June 17:

- 9:00 A.M. Registration and Badges, entrance Triangle Park.
- 9:30 A.M. Exhibits in meetings pavilion.
  - a—Aeroplane Engines
  - b—Aeroplane Wings & Parts
  - c—Liberty Engine & Parts
- 10:00 A.M. Business Session. Meetings pavilion
  - a—President remarks
  - b—Treasurer's report
  - c—Membership Committee's report
  - d—Section Committee
  - e—Publication Committee
  - f—Election Nomination Committee
  - g—Const. amendments
  - h—New business
  - i—Standards Committee report
- 12:30 Noon. Luncheon, dining hall, Triangle
- 1:15 P.M. Machine firing through propeller.
- 1:30 P.M. Petroleum refining, paper and demonstration. C. W. Stratford
- 3:00 P.M Heavy oil engines for automotive purposes.
  - a—S. E. Sargent
  - b—P. L. Scott
- 4:00 P.M. Aeroplane demonstrations over park
  - a—Aeroplane raid on trenches
  - b—Formation flying
  - c—Stunt flying
  - d—Manuevers
  - e—Bombing

Opportunity for examining engine and plane exhibits in meetings pavilion

- 7:00 P.M. Orville Wright dinner, dining hall in Triangle Park
- 10:00 P.M. Movies in front of baseball stand, Triangle Park
  Possibly illuminations

President Kettering, of the Society of Aeronautic Engineers.

Tuesday, June 18:

- 9:00 A.M. Meetings pavilion open for examination of aeroplane engines, planes and Liberty engine exhibits.
- 9:30 A.M. Demonstration Mfg. machine in Triangle Park.
- 10:00 A.M. Address, Propeller design—F. W. Caldwall.
- 10:20 A.M. Address, present day problems in aeronautics—W. B. Stout.
- 10:50 A.M. Address, Aeroplanes of today—F. L. Faurote.

Orville Wright, pioneer aeroplane inventor, who was tendered a remarkable testimonial dinner by the S. A. E.

- 11:20 A.M. Address, Comparison of Aviation engines
  Lewis
- 11:45 A.M. Possible report on Liberty engine tests.
- 12:30 Noon. Luncheon, dining hall, Triangle Park.
- 1:30 P.M. Reports on international aircraft conference.
  - a—C. M. Manly
  - b—D. H. Ehrman
  - c—C. F. Clarkson
- 2:15 P.M. Symposium on tractor development.
  - a—C. M. Eason
  - b—D. F. Davies
  - c—R. O. Hendrickson
  - d—Dent Parrett
  - e—Others not decided upon
- 3:30 P.M. Standardization in transport vehicles
  - a—Capt. Crossley, England.
  - b—Capt. Vandevelde, France.
- 4:00 P.M.—Demonstrations and exhibits.
  - a—Farm tractors
  - b—Ordnance vehicles
  - c—Quarter vehicles
  - d—Medical corp vehicles
  - e—Miscellaneous

Wednesday, June 19:

Dayton Factory visits.

The aeronautic exhibits included ten war aero-engines, the Liberty, Rolls-Royce, Renault, described on another page of this issue; the Hispano-Suiza, the Mercedes, the Benz, the nine-cylinder Le Rhone and others. There were four complete aeroplanes. The new De Haviland battleplane with its four machine guns created great interest, as did the Spad and German Rumpler. The original Wright machine, first flown in 1910, had a place of honor. The exhibits were arranged in such a way that the closest inspection could be made of the machines.

A dissembled Liberty motor was shown—every part from the smallest bushing to the crankshaft. A dissembled De Haviland was also shown.

It is not surprising that with such an atmosphere there should have been uttered by speakers at the Orville Wright dinner and at the other sessions so many expressions that deserve permanent places in automotive engineering history.

President Kettering was the vivacious leader; in fact, he was literally effervescing all the time. He wound up the meeting with a sermon on farm tractors by declaring that we are in the ex-cart stage of the automotive industries and that we must build better tractors for the farmers and stop over-selling them.

Our program of the last year in aviation came in for a tidal wave of praise. Howard E. Coffin, recent head of the Aircraft Production Board, attended most of the sessions and was the star speaker at the Orville Wright dinner. He is as firm a believer as ever in what has been accomplished in the past year and told how our training aviators are to-day averaging 220,000 miles of flying per day, which nearly equals nine trips around the world each day. In three months we will be producing in a dozen plants nearly 100 Liberty engines per day and yet in England they are only producing 50 per week of a well-known engine that we have been criticized for not manufacturing. Had we taken up the manufacture of the engine last year, when we started developing the Liberty, we would not have been in production as we are to-day.

European nations gave us a year to get into aviation engine production, but we are into production in eight months. The error we have made in our aviation program was that of too great optimism last summer, when we announced that we could do more than was humanly possible.

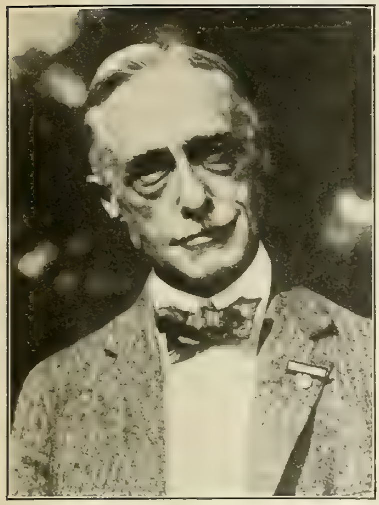
There have been seventeen different aeroplane investigations this year, and in every case excepting some in progress at present the investigators have given up in despair because of the magnitude of our aviation program.

Major Jesse G. Vincent told how fast the Liberty engine is by a comparison with an engine used in a motor truck, the same engine used in a light racing car and in a touring car, and Director Stratton of the Bureau of Standards gave his explanation of its speed by asking how fast is a locomotive and answered it by saying:

"That depends on the load it has to carry. If the Liberty engine is in a single-seater fighting plane it has very high speed. If in a two-man fighter it has a slower speed. If in a day bomber it is still slower and if in a night bombing plane that must cover long distances, carry heavy loads of bombs and remain in the air for many hours, its speed may not be over 90 miles per hour."

F. G. Diffin, one of the delegates of the S. A. E. to the International Aircraft Conference in London last February, declared that as a nation we underestimate the fighting strength of

Howard E. Coffin, who brought an optimistic message to the conference.



Elmer A. Sperry, of gyroscope fame.

Germany in the air, and that she is preparing to build in tens of thousands; that at present England and France have practically reached their limit of aircraft production and we must henceforth carry the burden.

The Professional Session

In opening the first professional session of the S. A. E. meeting President Kettering laid emphasis on the fact that all the displays on the ground were not of a commercial nature, but were gathered to serve an educational purpose. There had been no intention, he said, on the part of the Society to achieve any other aim than to educate the various industries which would be of service to the Government in the conduct of the war.

The aim in securing papers for the meeting Mr. Kettering said, had been to spread information on the various lines of engineering development work foremost at the present time. In this connection a word might be said regarding the activities of the Society. It was surprising to find how many people outside of the Society knew nothing of its existence. There were some who were using the data sheets of the Society and at the same time cursing the Society itself. It should be the object of the membership to get the people of the country to know that within the Society of Automatic Engineers was contained the talent that had made possible the automobile of to-day. The Society, Mr. Kettering said, had been loved and damned almost in the same breath, which was largely caused by lack of understanding of the motives behind its work. To overcome the antagonism with which the Society had met, the management had deviated slightly from established practice in arranging the program for this meeting.

Aeronautic Division Report

The serving wire for non-flexible single-strand steel cable now recommended is 0.0204-in. soft-steel tinned wire. It has been found that 0.08180-in. wire permits the use of a thimble having the same nominal size as the cable, whereas with the 0.0204-in. wire a thimble one size larger is necessary. The 0.0180-in. size is therefore recommended.

Air Craft Screws and Bolts

Aircraft bolts are usually long, and pass through wood, so that the fine tolerances specified for automobile screws, which pass through metal, are not required. The full strength of the aircraft bolt must be maintained, and therefore the maximum limit should be the nominal diameter with a normal manufacturing tolerance. In view of this condition it is recommended that the nominal maximum diameter be maintained, with tolerances as follows:

Sizes No. 4 to 10 inclusive, plus 0.000, minus 0.003 in.

In sizes No. 12 to ½ in. inclusive, plus 0.000, minus 0.004 in.

In sizes 9/16 to ⅝ in. inclusive, plus 0.000, minus 0.005 in.

Aircraft Bolt-head and Nut Dimensions

Thorough tests have been made of many bolt-heads and nuts of various thicknesses and grades of steel. As a result it is recommended that the practice for determining bolt-head and nut dimensions be as follows:

Full-strength nuts shall have a thickness equal to three-quarters of the bolt diameter.

Full-strength bolt-heads shall have a thickness equal to one-half the bolt diameter plus 1/32 in.

Thin nuts for shear bolts shall have a thickness equal to one-half the bolt diameter for ¼ in. and larger.

Check nuts shall have a thickness equal to one-half the bolt diameter for ¼-in. and larger.

In view of this it is recommended that the practice stated above shall govern bolt and nut design, but that dimensions for all thin aircraft nuts in sizes smaller than ¼ in. shall be in accordance with S. A. E. full strength plain-nut practice.

Aircraft Bolts Thread Pitches

Pitches for bolt sizes No. 8 to ⅝ inclusive have been recommended, but exception has been taken to the 12-32 size by both the Army and Navy, it being asserted that this should be 12-28 to correspond to the A. S. M. E. pitch. At the time the recommendation was made, the majority of aircraft manufacturers were using the 12-32 pitch and in order not to interfere with production it was decided that it should be used as a war measure.

As both the Army and Navy had issued specifications calling for the 12-28 pitch, it is recommended that the 12-32 pitch be changed to 12-28 for all S. A. E. aircraft screws and bolts in order to unify American aircraft practice. It is also recommended that aircraft bolt sizes 4-48 and 6-40 be added to the list of S. A. E. aircraft screws and bolts.

Recent A. L. A. Library Service in the Navy

At the Naval Training Station at Newport, R. I., the "House that Jack Built" is being equipped as a regular library, by the Training Station and the American Library Association in co-operation. The work is under the direct supervision of Dr. Edwin Wiley, librarian of the Naval War College. This building will hold about 10,000 books.

At Pelham Bay Naval Training Station, Miss Blanche Galloway is in charge of the library work. Further developments in the service at this point are expected in the next month or two.

The Mare Island Navy Yard will have an A. L. A. librarian within the next few weeks.

Charles M. Manly, pioneer aeronautic engineer, chairman of the Standards Committee.

Mr. W. B. Reese, at one time Post Librarian at the Presidio, in San Francisco, will be in charge. A small library headquarters building has been authorized.

Mr. Paul M. Paine, librarian at Syracuse Pubilic Library, is organizing the library work in the Naval, Marine and Military stations and camps in the vicinity of Charleston. He will gave general supervision also over the library work at Paris Island.

At Pensacola Naval Station, Mr. F. W. Jenkins, librarian of the Russell Sage Foundation, New York City, is in charge of the library.

Plants Combine to Aid in Winning War

Atlantic City.—The basis for a federation of all the industries of the nation as a forward step in winning the war was inaugurated at the War Convention on June 12. Manufacturers representing New York, Pennsylvania, New Jersey, Connecticut, Massachusetts and Delaware attended the meeting.

The federation, speakers said, would embrace 300,000 industrial plants employing upward of 10,000,000 men, with a capitalization of billions of dollars. The problems of safeguarding business interests after peace has bene declared also was under consideration.

Manufacturers representing about thirty thousand plants in the six States agreed upon the fundamental details of the Federation. The plan will be pushed throughout the country. In urging this action Austen Colgate, of Jersey City, said:

"Give us an organization of this kind, linking manufacturers of this country in one federation and there will be no problem during or after the war that we cannot solve."

A resolution was adopted by the manufacturers pledging to President Wilson their unfaltering support.

Coker F. Clarkson, under whose general-managership the S. A. E. has just concluded its most successful Summer Conference

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"Ace" Flies Over Lakes

Montreal.—Lieutenant Flachaire, the French "Ace," who has been assisting in French patriotic work here, left in his aeroplane for Cleveland at 11:30 A. M. on June 19. He planned to follow Lakes Ontario and Erie, and to make the trip in less than four hours.

To Sift Flying Accidents

Washington.—The Senate Sub-Committee on Aircraft is to inquire into the causes of the numerous accidents resulting in the deaths of student aviators. Chairman Thomas wrote Secretary of War Baker for the names of all men killed or injured in flying accidents, and the dates and places, together with the make of the machine, the kind of engine, and all other available data in each case.

PRESENT-DAY PROBLEMS IN AERONAUTICS*

By W. B. STOUT

Technical Advisor, Aircraft Board

IN attacking any problem for action and for real results three steps always are necessary.

First, one must know *what to do.*

Second, he must find out by research and analysis *how to do it.*

Third, by organization and executive control he must *do it.*

No one of these three divisions can be left out and still get really efficient action.

When the war started America, owing to the patent situation, had small knowledge of aircraft, aircraft designs or aircraft manufacture. The firms operating were few and of small talent. To enter the aeroplane business at that time was merely to invest in a lawsuit.

Europe having been at war for some time, had developed fighting aircraft, regardless of hindrances, and had seen, too, a certain amount of strategic possibility. In the time available there was no opportunity for us in America to learn, more than in a perfunctory manner, just what it was we had to do. The nation and some of its patriots were confronted with the problem of handling all three divisions of action at once, being actually organized and *doing* the job at the same time that they were learning *what they had to do,* and further getting their first education as to *how to do it.*

With all this in view and the confession of a colossal ignorance, not of *anybody* but of *everybody* in America so far as aircraft were concerned, it is a great credit to those who finished the first stage of aircraft production for war that they could do so tremendous a job in so short a time.

When one remembers that within one year a mushroom organization was confronted with the task of spending judiciously more money than was spent on the Panama Canal in eight years, one has a vision of what a real man's job this was.

When one adds to this the tremendous inefficiency forced upon the organization by past congressional acts, which bound every movement with red tape and suspicion, he sees the task three times as hard to accomplish as though the work could have been done under industrial methods of centralized trusted authority.

That to date in the aircraft program we have accomplished almost the impossible does not by any means prove that our problem is solved. We have spent the time to date learning what aircraft are and how they are being built in Europe. We have had little, if any, time to absorb the necessary lessons relating to production and shipping requirements which as we have them, are different from those of our Allies abroad.

With the present type of aeroplane construction—an attempt to copy foreign designs requiring foreign types of labor—we may never be the help of the Allies in the air that we wish to be. If America is to produce the cloud of ships which she has promised herself to put into the air, other means must be designed for building aircraft than those now existing.

Aircraft design can be divided into four major branches:

First, *aerodynamics* or the air theory of the plane.

Second, *structure,* which has to do with the materials and strengths of the different parts.

Third, *mechanical arrangement,* which is coupled very closely with both.

Fourth, *production design.*

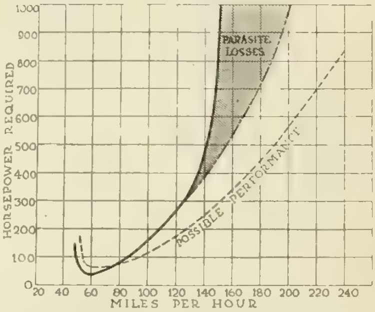

Fig. 8—The losses due to parasite parts in an airplane, the theoretically possible performance and the horsepower required for various speeds in m p.h

A fifth, known as *accessory design,* might be added.

Aerodynamics, in its fundamentals, is very simple. There is no final necessity for complicated mathematics in working out aeroplane problems.

If one advances a flat plane against the air, as in Fig. 1, the center of wind pressure *C* will be at the center of the plate *P.* If this same plate, however, is tipped at an angle and sent forward against the wind, the center of pressure will move forward up against the leading edge. Since to support an object one must lift it from its center of gravity, this plane at an angle will not support itself, since the center of the weight of the plane is at *CG* or the center of the plate, while the center of pressure *CP* is at the front. This will cause the rear end of the plate to fall, and instead of flying through the air, it will whirl about and fall without support.

As an illustration of this try to push a floating board under water with a stick. If we push down near one end of the board, that end will be forced into the water while the other end will still float so that the stick will slide off the end of the board. If we push to one side or in front of the center of displacement or flotation, the board will go under the water only at the point on which we push, but if we place the stick at the center of flotation of the board, we can push it entirely under the water from this one point of support.

In an aeroplane, there can be only one center of lift and one center of gravity, so that for free flight and proper balance, these must coincide. Thus, in order to make the plate support itself, either the center of gravity must be moved forward by adding weight to the front edge of the plate until the *CG* coincides with the *CP,* or tail surface area must be added at a negative angle to bring the *CP* back to the *CG.* For all flight, it will be seen that *the center of weight must coincide with the center of wind pressure of lift.* In an aeroplane, in order to obtain flight, the wing surfaces at the front must attack the wind at a certain angle, known as the angle of incidence, shown at *X* in Figs. 2 and 3. If left to themselves, the wings would not take this angle, but would merely travel through the air undirected, as does a stick or an arrow. To give them the proper angle of incidence the tail surface *T* is given a negative angle, so that when *T* travels horizontally, the lifting or wing surfaces will be tilted at the certain angle of incidence *X* to give them lift.

Aircraft must be designed for specific uses. If one is going to build a boat, the designer decides how fast he wants it to go, and how much load it must carry. Immediately he finds that a compromise is necessary, for if he builds a hull to give maximum lift or cargo capacity within its dimensions, he has lost speed possibilities and has produced a slow-going craft. On the other hand, if he designs for speed, there comes immediately the problem of reducing the weight of all parts, fuel and cargo, in order to get sufficient flotation within the dimensions that are required for speed. The same analogy holds in present-day aircraft, and the wing curve of a plane is a fairly decent analogy to the boat. A deeply cambered or curved wing, of fairly thick section, gives great lift at steep angles, and is ideal for weight carrying. This type of wing curve is shown above in Fig. 3. If, however, one designs for speed, he selects a wing better stream-lined and which disturbs the air less at flat angles.

Speed and Wing Pressure

Remember that at speed the pressure on the wing becomes greater per unit of surface area, and as the pressure becomes greater, the plane flies with a smaller angle of incidence.

Thus, when the heavy lift wing shown in Fig. 3 gets up to speed, it takes a smaller angle and offers at once a great deal of resistance to forward travel through the air. To try to make a wing of this curve travel at speed is just as sensible, as I have said before, as to attempt to

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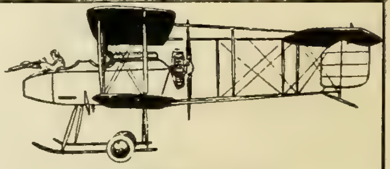
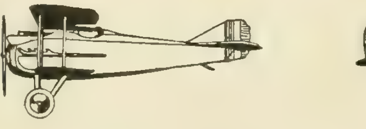
* Paper read before the summer meeting of the Society of Automotive Engineers.

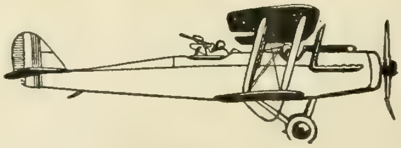
The Gotha, 1917



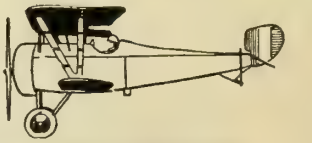
The Vickers Gun Bus



The Spad, 1917



The De Haviland 4, 1917



The Baby Nieuport, 1916

Recent
Types of
Planes

The Albatross III, 1917

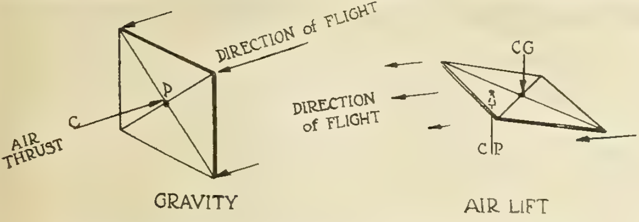


Fig. 1—Illustrating that the center of wind pressure on a plane and the center of gravity must coincide if the plane is to fly

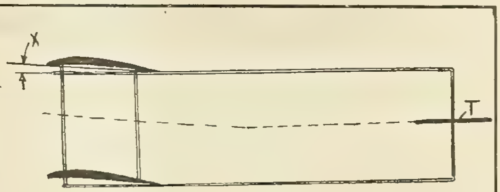


Fig. 2—Showing how the wing surfaces of a plane are tilted at the angle of incidence when the tail surface T travels horizontally

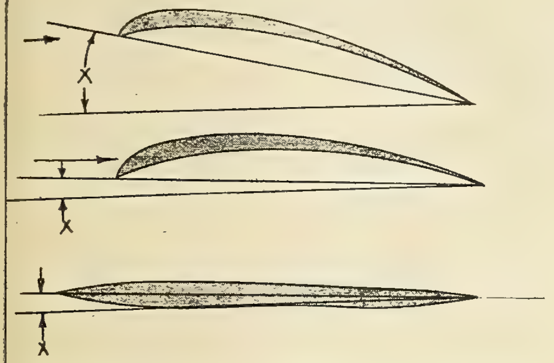


Fig. 3—A deeply cambered or curved wing, of fairly thick section, such as that shown at the top, gives great lift at steep angles and is ideal for weight carrying. The stream-lined wing of the races is shown at the bottom

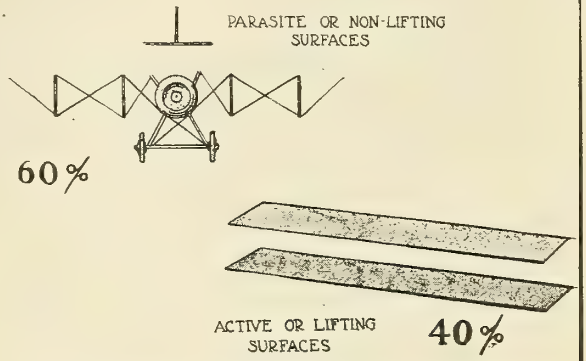


Fig. 4—Showing the so-called parasite parts of an airplane which are necessary for structural or operating reasons but which add weight and resistance without contributing to the lifting or supporting of the plane

crowd power onto a canal boat and turn it into a racing yacht. The addition of power will do nothing but pile up a bigger wave in front of the ship and will add almost nothing to its speed.

This has been proved in certain types of planes; we have replaced 400-hp. engines by engines of 200 hp., but as a result of double the thrust, the gain in speed was only 3 or 4 m.p.h. As a contrast to this, we have taken the same engine in a much heavier plane, but fitted with a speed wing curve, and have driven it at tremendous speeds.

This brings up one of the earliest ideas which was used to design planes for speed, and which was mentioned before the society last year by one of the speakers* from abroad. Although the heavy-lift type of wing cannot be driven to speed by the addition of power, yet the speed type of wing can be driven to greater lift by one of two methods, first by increasing the flying speed, which means landing speed, and second by adding greater area to make up for the loss per square foot of lift.

Racing planes, rather than having clipped wings of heavy lift, tend toward large wing areas and light loading, but with the nicely stream-lined wing curves shown in Fig 3.

In adding this wing area one must also add more wing area to lift the weight of the wing area he has just added, which is the equivalent almost of a dog chasing his tail. The additional weight per square foot in the wing is around three-quarters of a pound, yet, on account of the extra weight of this new wing surface also, one must figure a weight of 1½ lb. per sq. ft. for all the wing surface added.

Addition of weight on the wings, however, is not of much tremendous importance if one does not increase the flat-plate or parasite resistance, a point that I will explain later.

If the designer increases the weight, however, of the engine or body, known as the fuselage, he must add 3 lb. to his total for every pound of additional engine weight; either in extra wing structure, extra tank weight or fuel weight, or added truss. These figures are, of course, structural figures, but I give them to show how closely structural, all the way through, are connected with the aerodynamic considerations, and that in changing the aerodynamic features one cannot for a moment forget the structural fundamentals that he must follow.

By developing the idea of increased wing surfaces and greater penetration or speed possibility on the part of the wing curve, we have been able to build aeroplanes of such wing efficiency that the wings have now become one of the least points of resistance at high speed, for the parasite resistance is dominant.

Fig. 4 shows the so-called parasite parts of the aeroplane. These are the parts necessary for structural or operating reasons, but which offer resistance to forward travel without adding to the lift or support of the plane. They include struts, wires, landing gear, radiator, piping, exposed control wires, pulleys, body, tail surface edges, tail skid, and things which to the layman seem so trivial as to warrant no real thought. In a speed plane, however, the exposing of a water pipe from the engine to the top wing, might slow down the maximum speed of the plane 5 m.p.h. Adding stream-line wires in the place of round cables might add 10 m.p.h. to the speed of the machine.

In speed planes today, at maximum rate of travel, more than 60 per cent of the engine power and gasoline consumed is used up in forcing these parasites through the air, and only 40 per cent of the horsepower is usefully used. It is as though a speed boat going

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*Wing Com. J. T. Seddon, S. A. E., Transactions, Vol. 12, Part II.

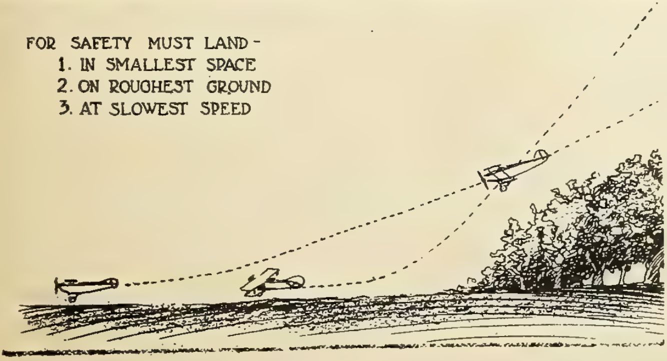


Fig. 9—A comparison of the landing of high and low speed types of planes

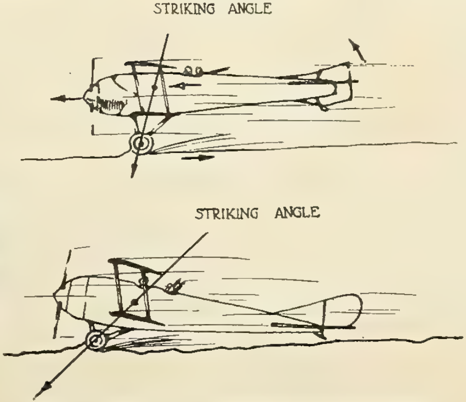


Fig. 10—Showing the difference in striking angle of planes with high and low centers of gravity

through the water, and having a beautifully stream-lined hull, should be forced to run a race with a log dragging behind, or like a car in a race with the emergency brake set the whole time, wasting power for nothing.

The greatest problem today of the aeronautical engineer, both as to aerodynamics and structure, lies in the elimination of the parasite, or as the British call it, "flat-plate" resistance.

While the aeroplane today contains essentially the same units of structure as in the beginning, yet the mechanical arrangement has varied as new engines, materials and processes and greater experience in flying have shown the way. The early two-propeller pusher with exposed pilot and no body construction gave way to the single-propeller pusher type with the pilot seated in front of the engine. In case of a spill, however, or a bad landing, the engine had a nasty habit of coming forward through the pilot before striking the ground, for which reason particularly this type of machine was gradually discarded. Another deficiency of this arrangement was that in case of propeller breaking, which happened on the small-engined machines of the early days, the pieces of the blade were likely to cut off the rear tail structure and bring the pilot to serious grief.

Then came the tractor type of plane first shown in the Nieuport monoplane with the engine and propeller in front and the pilot just back of the wings. This type of plane has passed through a high state of development in all sizes within the horsepower limitations of one engine.

With the next new mechanical arrangement first principles were used, two propellers being placed out on the wings and *pushing* the planes. The engines were directly connected to the propellers, and were fitted on the wing. This later gave way to a similar arrangement of the engines but with *tractor* propellers in front of the wings. Recently we have had planes fitted with many engines distributed over the wings, each with its separate propeller. Some of these machines weigh as much as fifteen tons.

Monoplane Construction Difficult

Outside of engine and propeller location there are three general mechanical arrangments of these tractor planes: Monoplanes, biplanes and triplanes. These types are so well known as to need no further description. The monoplane aerodynamically is the best type of design, but constructionally it is to date almost impossible. Requiring double the area in one wing for the propelling of the same spread or a deeper chord. This decreases the aspect ratio and hence the aerodynamic efficiency. To increase the span of the machine, means structural difficulty, as the spars can only be as thick as the wing section will allow and beyond a certain span this construction cannot be built with the factor of safety required in the air. Efficient monoplanes, therefore, are ordinarily flimsy and dangerous for quick evolution, having less space and heavier wing loading than the biplane on account of structural limitations. As a result, they have a considerably higher landing speed, which again makes them dangerous except for the most skilful of pilots.

A big disadvantage of monoplanes in war is the tremendous blind spot under the wings, where the pilot can see absolutely nothing. He can see everything above and out to the horizon, but nothing below him. The parasol monoplane developed with the wing above the fuselage so that the pilot can see beneath and above, gives excellent vision but compromises with center of thrust and head resistance in such manner that it is still of doubtful value.

Structurally the biplane is superior and is far less in weight per square foot, but again there is a difficulty of vision. Although the pilot can see more below, since he is farther up from the lower wing and has a narrower wing chord to hide his view, he has a second wing above him which slightly hinders his view, enabling a plane to dive on him from the front along a certain line without its being seen until it is close at hand.

Every blind spot on a machine is dangerous, especially in bombing machines or combat types, because the Hun pilot spying a machine from afar and "seeing you first" knows from the make of the machine just where the blind spot is and how he can sneak up under it or around to one side in such a position that he cannot be seen until he opens fire. In formation work one is not permitted to circle around in order to retain his vision in all directions. Over enemy territory, it is important that the pilot keep his place in the formation, traveling and reducing speed with it.

A man in a formation over enemy territory who misses his place in the line and for any reason falls behind is much like a ship, which in a convoy crossing the Atlantic has engine trouble and falls away from the protection of the battleships and destroyers. One never knows when a speed scout flyer is hiding in a cloud. The Huns follow a formation fleet cross-country as submarines follow a convoy and pounce at once upon any plane that drops behind to an unprotected position. If one flyer on the frings of the formation can by attack be forced to dive away from his fellows, he is immediately at the mercy of the Hun scouts who will not come too close for fear of receiving the combined machine gun fire of the squadron. If there is a blind spot in the machine, it is possible to force it out of formation.

To permit better vision and also in an attempt to decrease head resistance by the elimination of struts, the triplane has been used extensively. In this type the wing span can be fairly narrow, enabling the machine to land in confined places. The wings are so narrow that the pilot's view is almost complete while the tail construction is small and short, allowing greater agility for air flights and less chance of the enemy flyer hiding where he cannot be seen.

There is no decision as yet as to which is the best type, but in analyzing present-day problems one can suggest the following lines of experiment with each type of machine:

1—How can we overcome the visional and structural disadvantages of the monoplane in order to acquire the aerodynamic advantage which we must admit the bird type of plane possesses?

2—How can we develop the biplane for less parasite resistance and greater vision, although this type is to-day in a higher state of development than any other?

3—How can we obtain greater aerodynamic ability of the triplane to fit the decided structural advantages which it possesses?

We may thus run the gamut of experimentation from aeronautics to structure and back again in these three types of planes alone. And there are others unthought of.

Following this discussion of present possibilities and requirements in aeroplanes for war and of the next steps to fit what we know to the requirements of to-day, it is worth while to look ahead to see what the future offers in the eventual development of aircraft. In the development of the automobile not one-hundredth of the money per month was spent in perfecting models and ideas that is now being spent on aeroplanes. New automobile models were brought out annually and were in the experimental stage for months.

New aeroplane models must also go through these months of experimental work, but on an average new models and types are taking precedence on the battle front every eleven weeks.

The automobile industry has developed materials and processes, parts and types of organizations through years of effort. In developing aircraft we have all of these related industries and organizations to draw on for knowledge and material. We are thus able to move in development work *five times as fast* as was possible with the automobile, a fact which is worth more than passing thought. This means that the man entering the aircraft industry today *must think five times as fast* as the automobile executive, in order to keep up with the industry, and that an engineer must have five times as much vision and mobility of mind in order that he may keep his place in progress.

A very fine line must be drawn between conservation, as we have known it in other industries, and what we call conservatism in the aircraft industry. What would be reckless judgment in established industries might well be ultra-conservative judgment as related to aircraft design. It is largely for this reason that during the war period the business man of the old type has been so quickly eliminated from this new industry in favor of that type of man who thinks quickly and fast, and is willing to take long risks, trusting to his own judgment. This type of action necessitates great mistakes as well as great successes.

The British Air Board, for example, was changed five times in the first year of its existence, largely, we are told, because the industry grew faster than the vision of the men then in the Air Board could follow. This work is now entirely in the hands of one man, and a man of quick acting vision and definite commercial experience. That our own program is taking similar form, so far as organization goes, is one of the most encouraging items of to-day.

This type of vision naturally requires that research follow every available idea, and research is but a way of "wasting money intelligently." Tremendous sums can well be spent during the next few years in developing aircraft for war, remembering that a day of war saved means a gain of fifty millions of dollars and six thousand lives.

With these ideas in mind it would be well to conclude this analysis with visions as fanciful as we can summon to mind, which still are based on sound engineering judgment. From this viewpoint I predict that operating speeds will exceed 5 miles a minute in aeroplanes before we can call aircraft really developed machines.

I have discussed the parasite or flat-plate resistance as being a fundamental defect of aircraft. Fig. 4 shows the parts that at high speeds now form the greater part of such a loss.

The solid area in the curve, Fig. 8, shows approximately maximum performance to date. The ordinates indicate the horsepower required; the abscissas designate the miles-per-hour of speed. It is evident from this that above a certain point additional horsepower does not give an equivalent addition in speed, so that even should we double the horsepower of engines of the same weight we would not materially increase the flying speed of a plane as built to-day, although we could reduce its landing speed.

It is possible to operate wing sections efficiently at a speed of *8 miles per minute*, as is proved by propeller tips on machines flying at present. These tips in our Liberty planes travel 8 miles per minute, and their efficiency is nearly 85 per cent. There is no reason, from a pure engineering standpoint, why curves in the form of wings cannot perform equally well. The fundamental difficulty is in landing, for although it should be possible to build a machine today to fly at almost any speed we want, yet the landing problem is so great as to make real speed prohobitive.

If we learn from the German long distance gun, which sends its shell up from the earth to a point where the atmospheric resistance is negligible, we may also send airplanes to equivalent altitudes, with special engines developed for that work, and thus in a much lighter medium, with less resistance, obtain our speed range. This will require the solving of many problems. It will mean new propelling apparatus, or propellers. It may even mean special fuels to be used at altitude.

There are various ways of attempting the problem and as we are gaining experience through actual work at 20,000 ft. and over, it is possible and even, in my opinion, probable, that long distance travel in the future will take place at altitudes more than 5 miles above the earth's surface. It is as though a ship on the ocean could pick out for itself water of varying density, so that for speed work it would take a medium of less resistance; or to use another analogy—it is like the sea plane, which when its operator really wants to travel fast, rises from the water and ascends into a lighter medium, even though this lighter medium requires greater supporting area. In altitude work, however, this necessity for greater area will be compensated for by the greater speed, which is the fundamental desire.

Landing a Real Problem

And so we come to the problem of landing. As soon as we have a plane that we can force to travel at high speed (see the dotted possibility line of Fig. 4), landing will become a dominant problem. We ordinarily visualize safety in landing as depending on speed alone, but speed is only one of the elements of safety. That real safety may be had *three* things are necessary.

1—To land within the smallest possible area.

2—To land on the roughest posible ground.

3—To touch the ground at the slowest possible sped.

Eventually airplanes will land almost in their own tracks, much as a pigeon lands on a window sill or a sparrow on a wire.

It is by no means proved that our present method of landing airplanes is the final one and intensive study should be put on the development of new landing systems and schemes, that greater things may be accomplished.

In analyzing landing and any one factor concerned with it, the other fundamentals should be kept in mind. Modern speed planes, for example, landing at 50 m.p.h., need a large field in which to alight, on account of the angle at which they come down and the distance they roll after striking the ground. The airplanes used in the early exhibition work flew from and landed in ball parks and four-acre lots in comparative safety. Present-day machines cannot do this on account of the necessity for speed.

Here is a thing that we know can be done, and efforts should be made to increase the landing capabilities and safety of existing planes. All three landing fundamentals require separate study.

Speed in landing is largely a question of wings and their loading per square foot. A plane with a heavily loaded wing lands at a higher speed than one with a lightly loaded wing. A plane that leaves the ground at low speed is generally hindered in its high-speed; it is to fast to fly only when it lands at a speed too great for safety. Flying at a high sped, once in the air, is not a problem but an advantage.

If landing speed can safely be increased, then the maximum speed of the plane can be increased in proportion.

Planes with small surfaces in proportion to their weight glide at a steep angle and come down fast. After they have touched the ground, however, their air resistance causes them to stop quickly.

Slow Speed Landing

Planes with light wing loading "float" easily, coming down at a flat angle to their landing place. Although they touch the ground at comparatively slow speed, they roll a long distance before coming to a stop, and must travel a considerable distance before they first touch the ground.

I was interested in seeing a landing made not long ago by a pilot, who, unused to a machine of light wing-loading, had a plane of the "floating" type out for the first time. He made a beautiful landing in the center of the field, at a higher speed than the plane was designed to land at, although at the landing speed he had been accustomed to in other planes. Once on the field, however, he had acquired so much momentum that the plane went on across the field until it struck the fence on the far side.

Fig. 9 compares the landings of the slow-speed and high-speed types of planes, it being seen that the high speed plane, although it strikes the ground faster and at a steeper angle, comes to a stop more quickly and can land in a smaller space.

A machine of light wing-loading, coming into the field over the trees as shown, must float a long distance at a flat angle before it strikes the ground. If the pilot noses the machine down sharply over the trees, by the time he has lost sufficient altitude to flatten out, he finds himself making a high-speed landing, so that the fact that his machine can land at slow speed has done him no good. After he strikes the ground, as just explained, he rolls a tremendous distance, and is in great danger of breaking the machine, although with small danger to himself on account of the comparatively slow speed.

The problem then is not entirely one of landing speed. No matter what speed the plane lands at, within reason, if the wheels strike no obstruction the landing is a safe one. If, however, at high speed they strike a hole, or a ditch, or a rut, there is a tendency for the machine to nose over, or even turn a somersault, to the great danger of its occupant. This danger is, of course, less at a lower speed. In other words, in an emergency landing with a high-speed landing machine, there is really less danger of running into objects bordering the field. There is danger, however, of nosing over, if the field is bumpy.

With a machine landing at high speed one can see that having the weight close to the ground would be a considerable advantage, a point that has been discussed somewhat in connection with mechanical arrangements. This indicates a requirement in engine design that has been lost sight of during the early development period when engineers have been learning the fundamentals of aircraft design. This requirement is that the center of thrust due to the engine should be high, or stating it in another way, that the center of weight of the engine should be low, and coincide as nearly as possible with the center of thrust of the propeller, which is, of course, at the engine shaft.

If the center of gravity on an airplane be low, then the striking angle from the point of contact of the wheels to the center of gravity of the plane, Fig. 8, will be considerable. If this angle is small there is less danger of nosing over. If it is nearly 90 deg. then there will be a great danger of a somersault, hindered only by the area of the tail surfaces. A requirement for safe landing, therefore, is a low center of gravity, and large area and leverage of tail surface.

With the floating type of slow landing machines there is just as much risk of accident with the machine but less danger to the occupant on account of the slower speed.

Future Problems

There is real opportunity for study and research to devise such mechanical arrangements—different from those now in use—as will enable higher speed landings to be made, and with quick stops.

This might be accomplished with a brake on the floating type of machine. An air brake will not do, as at the slower speeds it would have to present, presumably, to great an area to be effective. A ground brake will not entirely do, because at the time the machine first touches the ground the pressure on the wheels and skid is so small as to be almost ineffective. To apply brakes to the front wheels would be like striking a bump, and would probably mean a spill.

I am not stating how this problem of landing is to be solved. I am merely mentioning it as one of the present-day problems of aeronautics that we can well consider as of first importance.

In studying landing remember that if we can add 10 m.p.h. to our landing speed, we can add 20 miles or more to our flying speed. The ideal machine, of course, will be one of sufficient area to make a successful "pancake" landing, but machines with wing loading light enough to accomplish this feat are, with our present knowledge of structure, not within reason.

AEROPLANES OF TODAY*

By FAY LEONE FAUROTE

NO subject, if we are to believe the press today, is of more interest to the world at large, and the United States in particular, than that of aviation. This is naturally so because of its supposed vital bearing on the outcome of the war, and because it bids fair to usher in a new and yet unexplored commercial area afterward.

When the Wright brothers, on Dec. 17, 1903—only fifteen years ago—startled the world by their short but successful flight in a heavier-than-air machine, the most prophetic of us little knew the development that the next fifteen years would bring. The war came, and with it an accelerated progress, such as an industry has never known before, a mechanical activity of the most exciting sort, a marvelous awakening of invention, a speeding up of manufacture almost unbelievable; for despite what our critics say, huge steps have been taken, and still larger ones are in process today. The art of aviation has thrown off its swaddling clothes.

From the frail framework of the Wrights', with its little 16-h.p. engine, to the giant Handley-Page, Caproni and Curtiss flying-boats is a far cry. Only a Jules Verne could have imagined or foreseen such an astounding development. War is a hard master, a driver of men and minds, a quickener of invention superlative. To what an extent it has hastened aeronautical development can best be realized by a survey of the hundred years preceding this century.

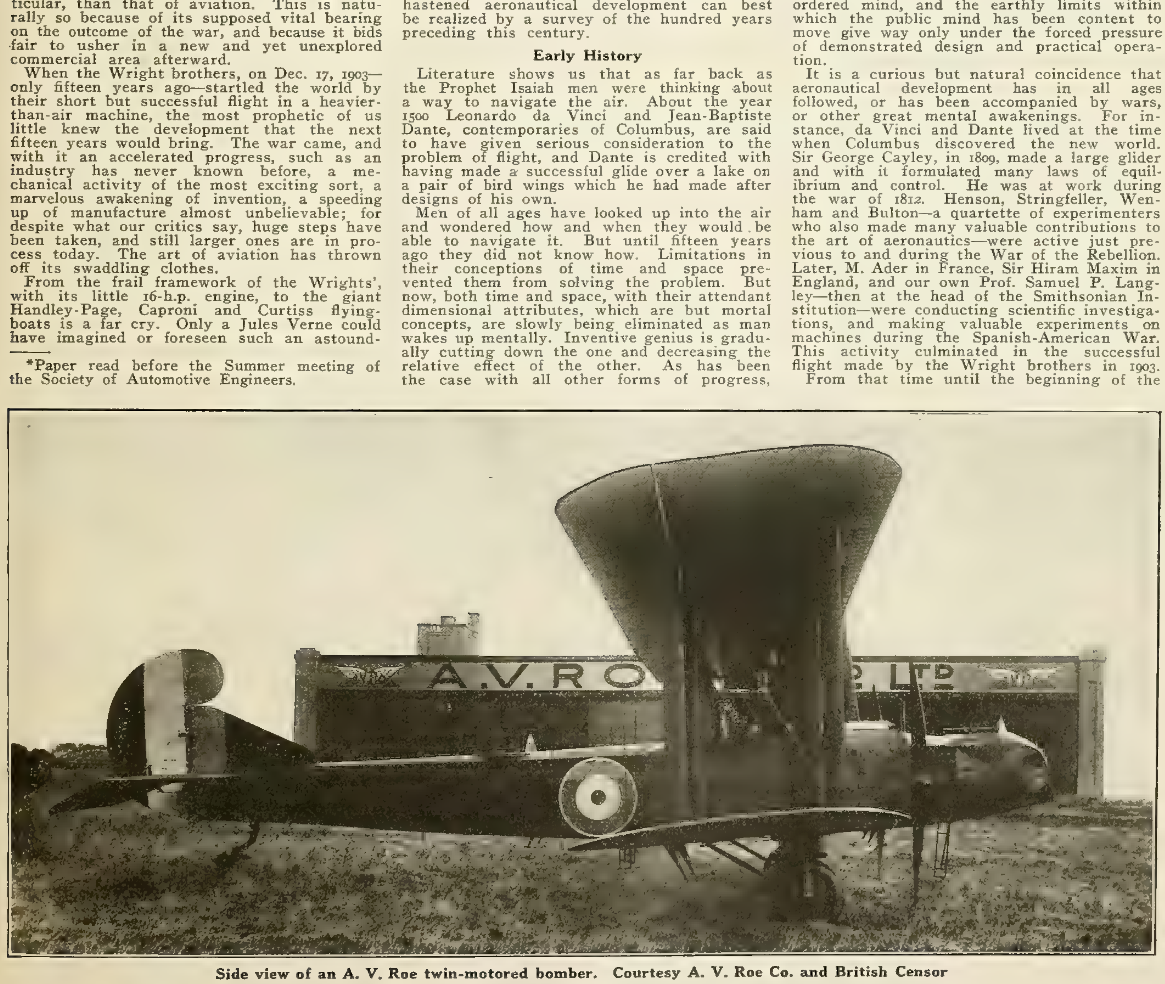
Early History

Literature shows us that as far back as the Prophet Isaiah men were thinking about a way to navigate the air. About the year 1500 Leonardo da Vinci and Jean-Baptiste Dante, contemporaries of Columbus, are said to have given serious consideration to the problem of flight, and Dante is credited with having made a successful glide over a lake on a pair of bird wings which he had made after designs of his own.

Men of all ages have looked up into the air and wondered how and when they would be able to navigate it. But until fifteen years ago they did not know how. Limitations in their conceptions of time and space prevented them from solving the problem. But now, both time and space, with their attendant dimensional attributes, which are but mortal concepts, are slowly being eliminated as man wakes up mentally. Inventive genius is gradually cutting down the one and decreasing the relative effect of the other. As has been the case with all other forms of progress, however, the world is loath to accept the new. The practicable plan of a real inventor is looked upon as a fanciful distortion of a disordered mind, and the earthly limits within which the public mind has been content to move give way only under the forced pressure of demonstrated design and practical operation.

It is a curious but natural coincidence that aeronautical development has in all ages followed, or has been accompanied by wars, or other great mental awakenings. For instance, da Vinci and Dante lived at the time when Columbus discovered the new world. Sir George Cayley, in 1809, made a large glider and with it formulated many laws of equilibrium and control. He was at work during the war of 1812. Henson, Stringfeller, Wenham and Bulton—a quartette of experimenters who also made many valuable contributions to the art of aeronautics—were active just previous to and during the War of the Rebellion. Later, M. Ader in France, Sir Hiram Maxim in England, and our own Prof. Samuel P. Langley—then at the head of the Smithsonian Institution—were conducting scientific investigations, and making valuable experiments on machines during the Spanish-American War. This activity culminated in the successful flight made by the Wright brothers in 1903.

From that time until the beginning of the



Side view of an A. V. Roe twin-motored bomber. Courtesy A. V. Roe Co. and British Censor

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*Paper read before the Summer meeting of the Society of Automotive Engineers.

Great War some progress was of course made, but it is probable that had not the demand been greatly stimulated by the necessity of the Allies and Central Powers, we should still have only small planes of limited power, carrying capacity and radius.

The strategic value of an aeroplane, however, quickly brought aerial development to the fore and artificially stimulated experimentation, development and manufacture, first in Europe and then in the United States. The discovery that Germany had for years been planning the building of giant Zeppelins, making aerial maps, designing and building aeroplanes and every aerial device connected with their use, shocked the rest of the world into the realization that if it were to compete successfully with Germany it would be necessary to build machines of large carrying capacity, of a speedy character and wide cruising radius. The internal combustion engine, brought to a comparatively high state of development by its use in the automobile, rendered this possible.

To really appreciate the problems which five years ago engineers were called upon to solve, it might be interesting to take a look for a moment at the situation ten years ago—say in 1908—when most of the American flying machines were in a "featherless state," so to speak; when aside from a few exhibition flights, little of commercial value has been done. The Wright brothers, Glenn H. Curtiss, Chanute, Dr. Alexander Graham Bell, Capt. Thomas Scott Baldwin, Lieut. Selfridge, J. A. D. McCurdy, Charles Manly, and a few other pioneers, were all busily engaged proving the truth of their theories. The Wright brothers had met with some commercial success, and at military trials had demonstrated the worth of the aeroplane as a fourth arm of the service, thereby gaining Government recognition. Curtiss and Baldwin had made dirigibles and aeroplanes and flying boats of various shapes and sizes. The Aerial Experimental Association had built three biplanes, the last one of which, the "June Bug"—at an official trial arranged under the auspices of the Aero Club of America, made the first publicly advertised flight, in July, 1908. The machine successfully flew 2000 yards over an S-shaped course at a speed of 39 miles an hour.

Later, Curtiss made his famous flight down the Hudson from Albany to New York in one of his biplanes. As most of us no doubt know, there are few landing places between Albany and New York City. One was found near Poughkeepsie which Curtiss used on his way down. Fearing that perhaps he might not be able to choose a landing place, and being unwilling to have his machine smashed on the rocks, he had sometime before conceived the brilliant idea of putting on, in addition to his wheel-landing gear, twin pontoon-floats, so that if worst came to worst he could land on the surface of the Hudson River. He said he always had a feeling that water might be safer to land on than the earth, and that at least he could land on the water without a bad smash-up if he had to.

This machine, which he called "Triad," is therefore interesting as a forerunner of the hydroaeroplane and flying boat, both of which developments he later carried out to a successful conclusion. On Lake Keuka on the smooth waters of the Spanish Bight just inside San Diego Harbor, he developed the flying-boat and hydroaeroplane. It was here that he also came in contact with Army and Navy. Foreseeing the value of the aeroplane for army and navy work, he invited officers to be sent to his camp for training, and so during the winter trained many of the army and navy fliers who today are directing the destinies of our aerial forces. It was here also that he flew from land out to a battleship, landing alongside in the water, was hoisted aboard, dropped overboard again, and flew back to land. A year before Eugene Ely had succeeded in flying from land, in a land machine and alighting on the deck of a battleship. It was at this time that both the Wright brothers and Curtiss demonstrated the possibility of aerial bomb dropping, and predicted the remarkable part that aeroplanes would play in any future conflict in which the world might become involved.

On all these early machines, the pilots sat in an exposed position. Little attention was paid to resistance and streamlining, and because of the fact that most of the machines were pushers, it was necessary to put the radiator well up to the front and between the wings and put the pilot and his passenger forward. Control systems were more or less fragile and unmechanical pieces of apparatus, designed to suit the purposes of the individual pilot. No attempt, of course, had been made to standardize them nor to work out similar movements for controlling the various surfaces.

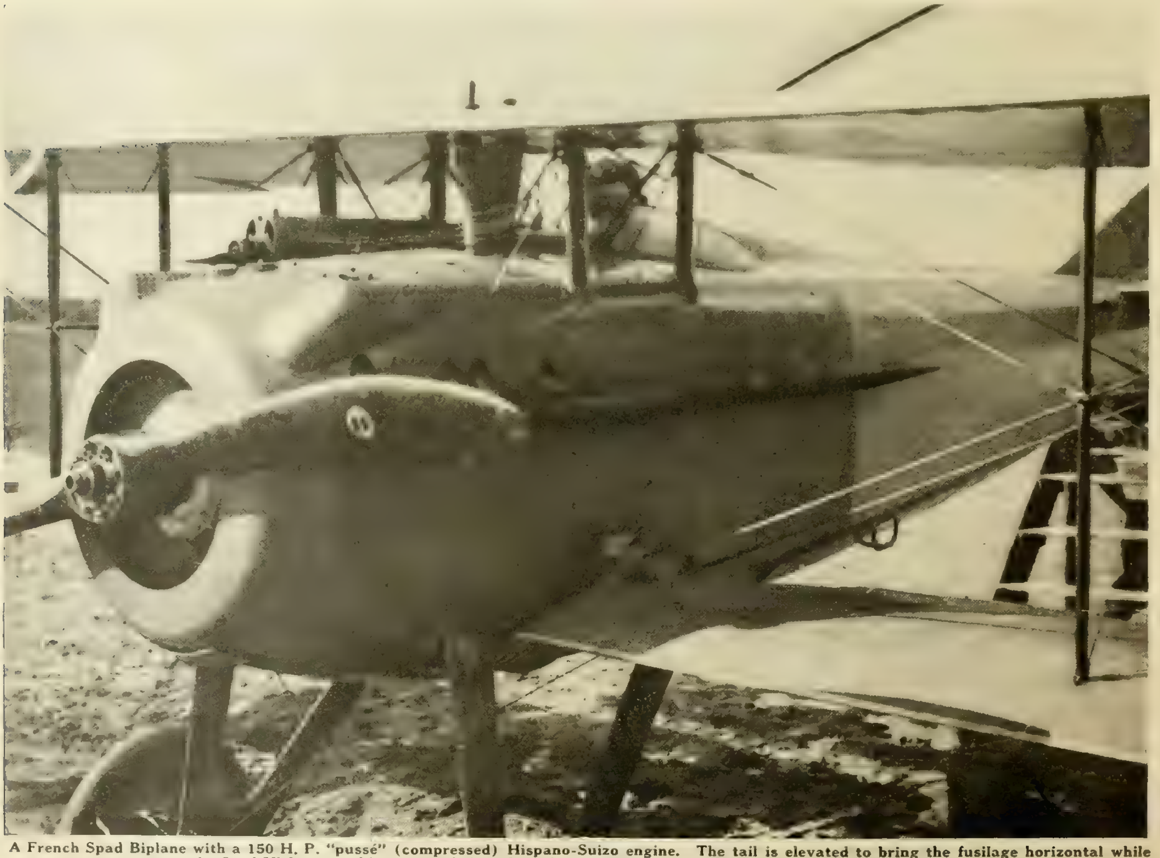
Early Design

Landing gears differed materially as did the methods of geting off. The Wrights used a form of pylon and counter-weight for launching their machine from skids.

The body or fuselage was not inclosed, the struts were not stream-line, neither was the landing-gear. The rudders were crude affairs, and the wing-panels, judged by the standards of today, were flimsy things of cloth and sticks.

All praise to those brave men who risked their lives for the development of aviation! To the Wright brothers who—in spite of all odds, laughed at by friend and foe alike, at last had their efforts crowned with success, and from comparative obscurity placed their name, and that of Dayton, upon the lips of the world—I wish to pay tribute. To me there is always in the character of every pioneer a certain something which inspires a feeling of awe; a certain far-away look, a prophetic cast of the eye almost childlike in its expression, that removes him from the crowd and causes him to be marked among men.

It were as if God Himself looked out upon the world through the eyes of His chosen few—inventive geniuses, reformers, great minds, they are; where do their ideas come from, where indeed, if not from Divine Intelligence? Surely no human hand nor mind has trained their cunning; given them their starting point, perhaps; but what of their prophesies, their enlarged views—these alone must come from Above. They are the ambassadors of Spirit, so to speak, the human mouthpieces of Divine Mind, the wideners of the vision of life itself. As such they can no longer be considered as individuals, beholden only to themselves, they are the property of the world, the hostages of society, the almoners of inventive gifts for which the world can never adequately repay them. Modest to a degree, the true genius seldom realizes his mission, nor claims his own until the world, awake at last, honors, alas! sometimes, too late to be of any real benefit to him. History alone develops the true greatness of his discoveries and grants to his memory the fitting crown of unselfish success.



A French Spad Biplane with a 150 H. P. "pussé" (compressed) Hispano-Suizo engine. The tail is elevated to bring the fusilage horizontal while the fixed Vickers machine gun is being aligned and timed to fire through the sweep of the propeller.

A German Rumpler type machine captured by the French. (French Official Photo)

Interesting Facts

And now just a few words about the theory of flight. Many models and forms of aeroplanes have been studied, many experiments performed. The theory of flight is fairly well known, so that definite results can be predicted from certain known conditions. Scientists and mathematicians have interested themselves in this branch of the engineering art, and M. Eiffel, Lanchester, Zahm, O'Gorman, Hunsaker and others, have made many valuable contributions of facts upon which aeronautical design now rests securely. This scientific research has revealed many seemingly strange things.

Few people, for instance, know that about 66 per cent. of the lifting force of the air is due to the suction on the upper surface of the wing panel, while only about 33 per cent. can be credited to an actual pressure of the air on the under sueface. It is also a significant fact that the amount of force required to move a small wire through the air is as great as that required to move a streamline strut several times its diameter. The influence of the streamline was formerly little understood and seldom taken account of in the design of struts, body and landing gear. Scientific experimentation, however, revealed the necessity of cutting down head resistance, thus decreasing what is known as the "drag" or "drift." It indicated the necessity of changing the surfaces, the cross-section of the wing panels, the sections of the struts and other exposed surfaces, to forms which would offer less resistance.

Effect of Streamlining

It is easy enough to push a thing into the air but it is hard to get it out without creating a disturbance. If we take a broomhandle, for instance, and sweep it through the air rapidly we find, if we could examine the air immediately following it, that a small vacuum is created just back of the stick itself, and that eddying occurs right behind it, creating a V-shaped partial vacuum which decidedly increases the total power required to move the stick through the atmosphere. It was early found by experimenters that by filling up this vacuum, and changing slightly the entering surface, that the stick could be passed through the air much more easily; a considerably smaller amount of power would be required to move it.

Now, when we design an aeroplane we know before it goes up into the air almost exactly what it will do. We know, for instance, that a certain type of wing-form has certain characteristics: one is good for weight carrying, another for speed, still another seems to combine successfully several desirable characteristics. Investigators have also discovered that there is what is known as an "end-wash" on a wing panel and that this can be eliminated by cutting off the corner of the panel.

Angle-Ended Planes

Most American and Allied machines use that type of panel in which the end edges form an angle, the apex of which points to the front of the machine, but Bleriot has used a type of panel in which the angle formed by the end edges points to the rear of the machine. Both types of panels have shown good performance. This latter type of end section is known as the Bleriot end. The angle at which the wing panel meets the air is another subject of wide interest. The angle of incidence, for instance, which is the angle between the direction of flight and a tangent drawn through the lower surface of the wing panel, may be varied with interesting results.

Of course, the whole object of all this work is to decrease the "drift" or "drag" and increase the "lift"—in other words, to secure a large "lift/drift," or efficiency ratio. Drift is always concomitant with lift. Drift is a measure of the waste energy that is spent in order to accomplish work. We cannot get lift without drift. Lift is a measure of the effective work, and drift is a corresponding measure of the amount of work which is absorbed or lost at the expense of which we get the lift.

Other observations are: A biplane is about 82 per cent as efficient as a monoplane of the same total surface if there is no stagger in the biplane arrangement. A triplane is about 60 per cent as efficient for the same wing area. A monoplane has 1.22 as much lift as a biplane and 1⅔ as much lift as a triplane. A biplane has 1.36 as much lift as a triplane. All of these ratios are on the basis of equal areas. The effect of stagger is to increase the efficiency of a biplane from 82 to 87 per cent, depending upon the stagger. For general purposes an aspect ratio of six is used. Fast racing machines usually have an aspect ratio of about six. For slower, weight-carrying machines, an aspect ratio of about seven or eight is used. The aspect ratio of the JN-4D is 7.3.

Modern aeroplanes may be divided into the following general types:

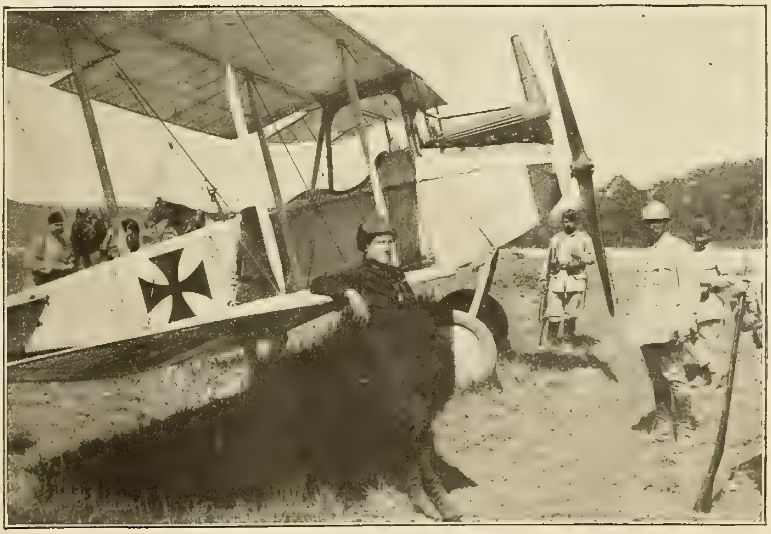
(1) *Combat Machines.* These are small, very fast, single-seater fighters, used for scouting purposes. They usually have wing spread of from 20 to 25 ft., a speed of 125 to 135 m.p.h., carrying capacity of 450 lbs., and a climbing speed of 10,000 ft. in from 8 to 12 min. The Spad, Nieuport, Morane, Curtiss-triplane, SE-5, Sopwith, Dolphin and Iserman Albatross single-seater are examples of this type.

(2) *Reconnaissance and Photograph Machines.* These are a slower flying machine intended for reconnaissance and photographic work. They are used for artillery spotting, map making and general reconnoitering. The wing spread is usually from 40 to 60 ft., and the speed from 80 to 100 m.p.h., the carrying capacity from 800 to 900 lb., the machines being two or three seaters, and having a climbing speed of 10,000 ft. in 12 to 25 min. Examples of this class are: De Haviland, Bristol, Curtiss, Voisin and Farman.

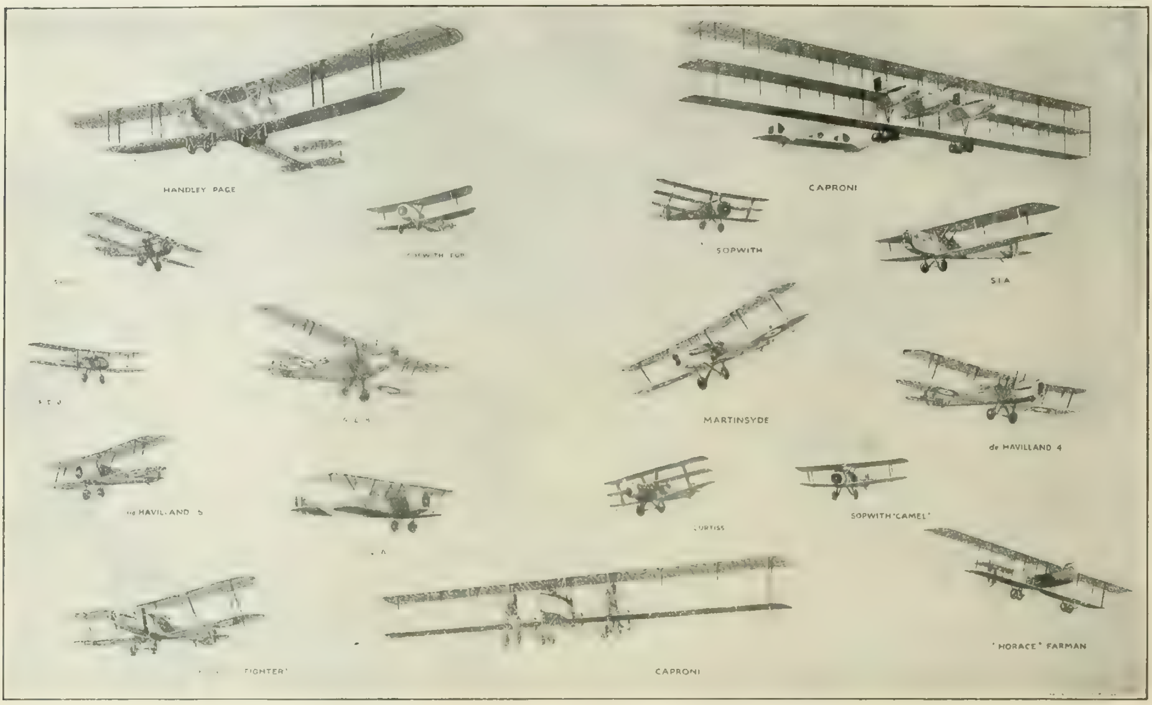
(3) *Battleplane.* The battleplane is a two or three-passenger machine driven usually by one large or two fairly good-sized engines, and equipped with a number of machine guns and sometimes with a cannon. It is a moderately fast machine, making from 70 to 85 m.p.h. The Voisin is a good example of this type. It is credited with carrying a one-pounder.

(4) *Bombers.* These are of the same general type as the reconnaissance machines but slightly larger. They vary in size from 45 to 90 ft. in wing spread, and carry from two to twelve people in addition to their war load of bombs and fuel. Their speed is from 75 to 100 m.p.h., their radius of operation from 500 to 1,000 miles, and their climbing speed 7,000 ft. in 30 min. Examples of large bombers are: Handley-Page, Caproni, Breguet, the Caudron (a twin-engined French machine), the German Gotha, the Friederichshafen, the German AEG, and the big Curtiss boats. Machines that have been used for day-bombing and other purposes, but have lost their 'pep" in remodeling, are many times used for night-bombing.

For naval work, flying-boats and hydroaeroplanes of various sizes are used. On account of the weight of their hull or pontoons these mechines compare favorably with reconnaissance machines traveling at as high speeds as 90 to 100 m.p.h. Used for coast patrol work and for naval observation purposes, they operate from stations on the coast, battleships or motherships that accompany the fleet. Hydroaeroplanes are similar in construction to land machines, except that in place of the landing-gear, single or double pontoons are fitted below the wings so that the machine may rise from or alight on the water. Most hydroaeroplanes are lighter than flying-boats. For that reason, where a craft is desired for inland water work or for short scouting trips, the hydroaeroplane is considered by many to be a very desirable type. Unlike the land machine, it is not necessary to fly high in order to pick out a suitable landing place; one can land on the water almost anywhere. For larger sea voyages, however, especially when it is necessary for the craft to remain for some time away from its base of supply, a more seaworthy type of



A German Rumpler type biplane



Representative Allied aeroplanes of 1917. From "The Aeroplane" (London)

hull is necessary. The large 92-ft. wing-spread flying-boats, which the Curtiss Company has built in large numbers, are good examples of this type. These boats have a wing-spread of about 90 ft., are about 46 ft. long, and have a hull shaped very much like a sulphur-bottomed whale. The hull is 42 ft. long, the inside is electric-lighted, completely equipped, and so arranged that one can move about comfortably. A boat of this size will carry a little more than 2,000 lb. I have been told by English officers that this boat has given a good account of itself, and that a large number of pilots have been decorated for their splendid work in attacking and downing Zeppelins in the Channel.

Conclusion

American manufacturers are not standing idle as some people seem to think. There have, of course, been many discouraging delays—many of which might have been prevented, many of which could not. I believe, however, that we are now fairly well on our way to good and continuous production.

Americans are known as great manufacturers and great inventors. American inventive genius always has and I believe always will continue to lead the world. Out of the brain of the Americans came the aeroplanes of yesterday and

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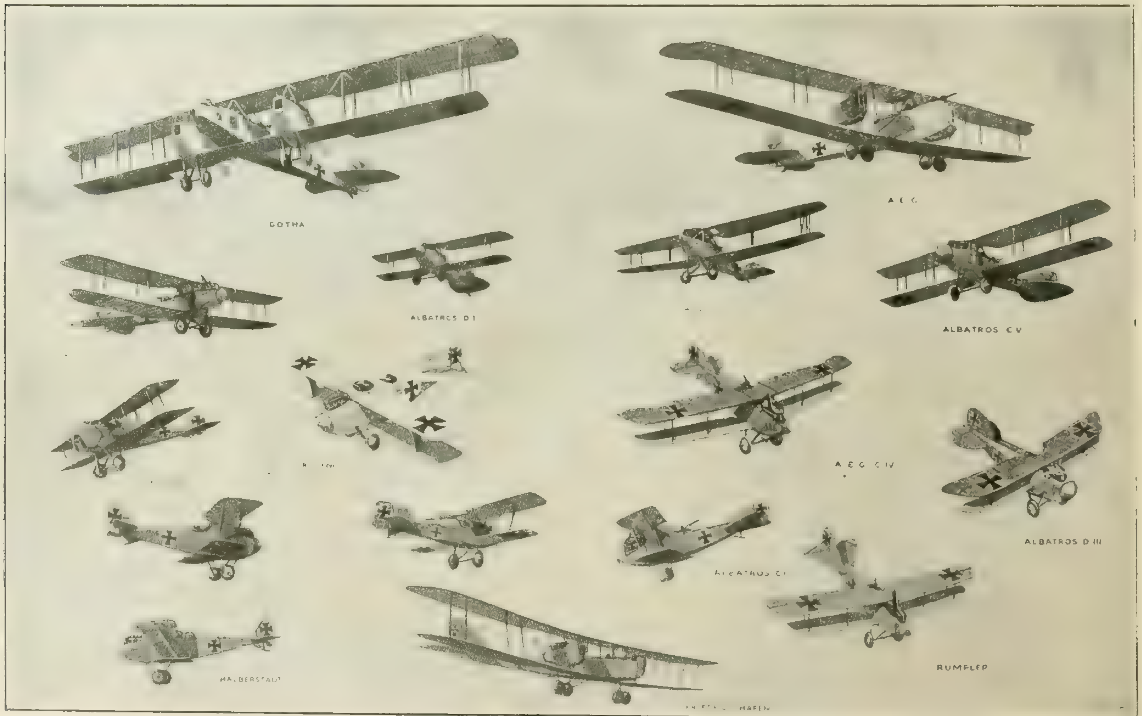


Diagram of the German aeroplanes that have been used during 1917

© The Aeroplane (London)

THE RENAULT 400-H. P. AIRCRAFT ENGINE

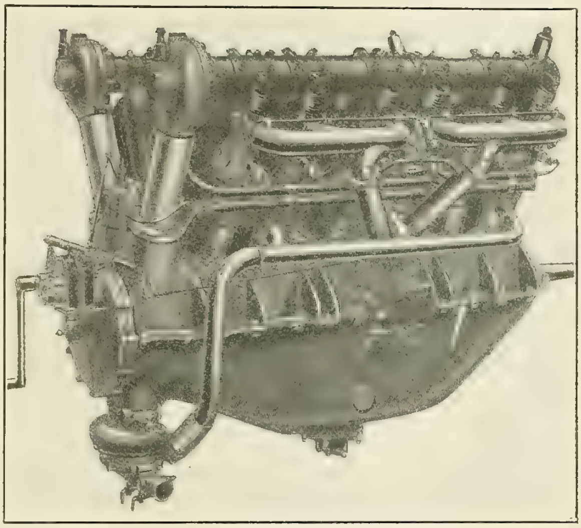
ONE of the largest aircraft engine plants in France and in the whole world is that of Louis Renault at Billancourt, near Paris. Aviation development attracted Louis Renault from the very beginning, and in 1909 he turned out his first aircraft engine, an air-cooled model of 70 h.p. This was followed by an 80 h.p. model later the same year. In 1912 Renault turned out his first water-cooled aircraft engine of 150 h.p. The following year saw his first 12-cylinder engine of 200 h.p. In 1914 this engine was redesigned and the output increased to 270 h.p. In 1915 a representative of the U. S. Signal Corps was sent to France and brought back with him the first Renault aviation engine ever seen in this country. The next year the Renault engineers developed a 300 h.p. engine, and in 1917 a 400 h.p. model was brought out which is now in production. This latter, by the way, weighs less than 2 pounds per horsepower.

To date Renault has delivered over 15,000 aviation engines to the French, British and Allied governments.

Complete aeroplanes of the Breguet type are also being manufactured under license in the Renault plant. These, of course, are fitted with Renault engines, and the whole machines are being built complete in the Billiancourt works. The planes for General Pershing are being made under the supervision of Pershing's men who are in the plant all the time.

Considerable pride is being taken by the Renault firm in the fact that it was the first to bring out an acute angle Vee engine for aircraft, As is well known, the conventional 12-cylinder engine has its cylinder blocks set at an angle of 60 degrees, this being the angle insuring uniformly spaced explosions. The Renault engine has its cylinders set at an angle of 47½ degrees. A closely similar practice is followed in the Liberty aircraft engine, which employs a 45 degree Vee. The object in making the angle of Vee so small is to reduce the head resistance.

Renault engines are used for various classes of aircraft, including training planes, bombing planes and combat planes. These engines are of the sturdier class and are not used in the scouts and similar types of machines which require engines of the very highest weight efficiency without so much regard to reliability or durability. As an indication of the growing endurance of aircraft engines it is interesting to note that the service period of Renault aviation engines before they are subjected to an overhauling has been increased from 120 to 200 hr., and this is believed to be the longest consecutive service period of any aircraft engine.



The 300 H. P. twelve-cylinder Renault engine.

We are indebted to *Automotive Industries* for the following facts concerning the Renault 12-cylinder motor. The cylinders have a bore of 125 mm. and a stroke of 160 mm. (4.92 x 6.30 in.).

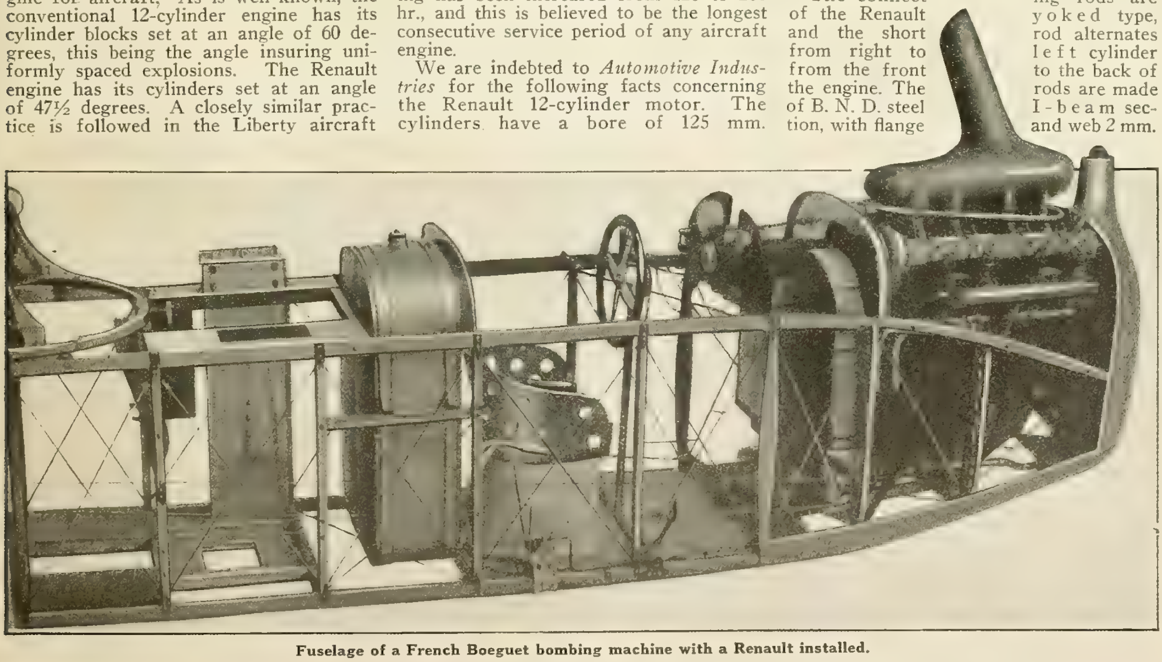
The cylinder water-jacket completely surrounds the exhaust valve guide. There are two valves for each cylinder of 66 mm. (2⅝ in.) diameter. The valve port is 61 mm. (2 13/32 in.) and the inlet to the elbow 53 mm. (1 3/32 in.) in diameter. The valve stems are both 11 mm. (7/16 in.) diameter, with a head approximately 5/32 in. thick and a 45 degree seat ⅛ in. wide.

The end of the valve stem is threaded to carry the spring cup and lock nut. Each cylinder barrel and head is machined from a forged bar, after which the intake and exhaust elbows are welded on, and finally the pair of cylinders is incased in a jacket which is welded from three pieces of steel about 1/32 in. thick. The cylinder walls themselves are 3 mm. (7/64 in.) thick. A standard two-bolt flange is used for all intake and exhaust port connections and has been profile-milled out of steel. The flanges are screwed on the cylinders and welded and brazed on the intake and exhaust pipe.

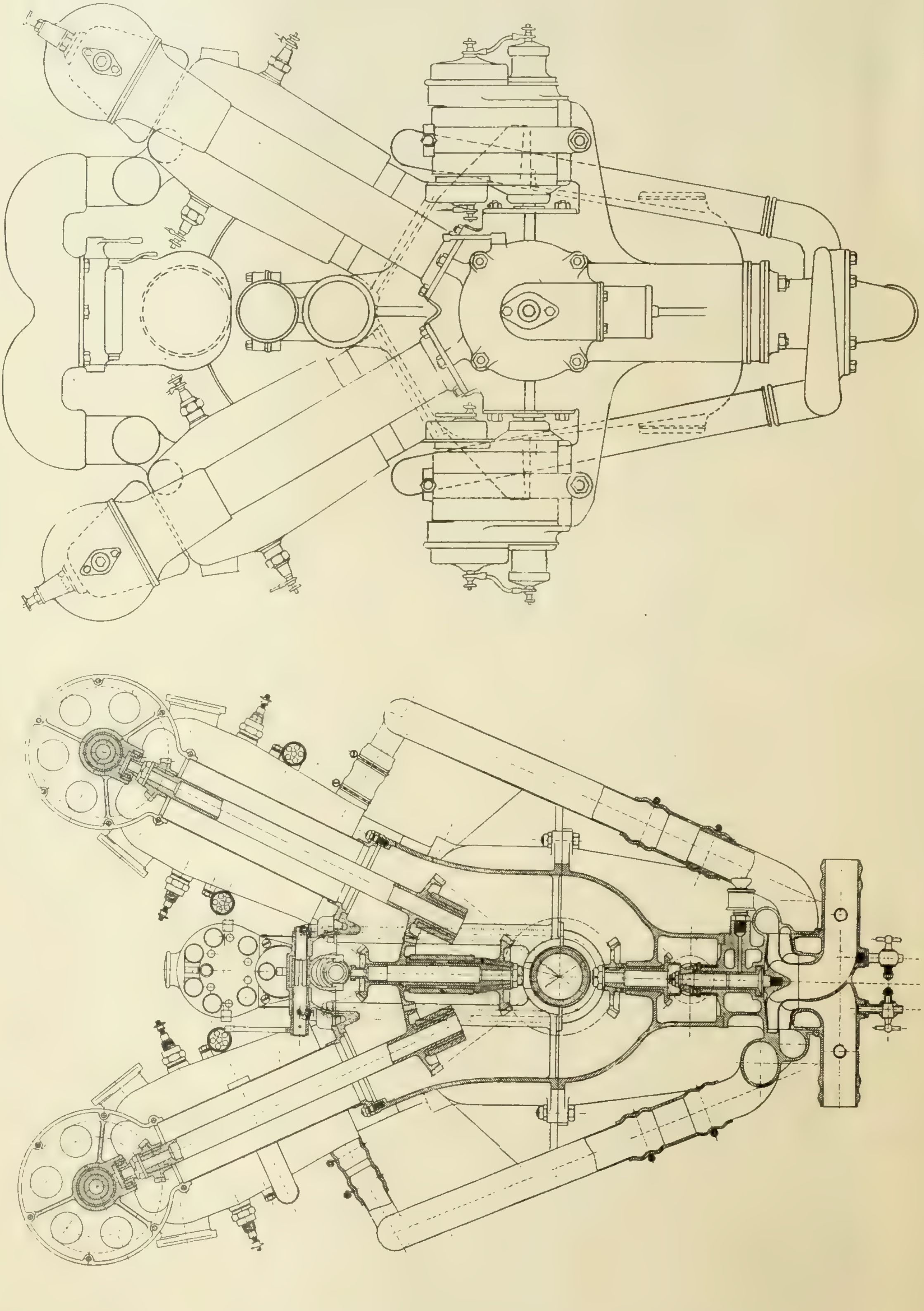
Aluminum Pistons

The pistons are of aluminum. They carry three concentric rings which are pinned at the ring gap. There is a deep annular rib between the piston bosses. The pistons are also unusually short, only 95 mm. (3¾ in.) in length. The piston pin is 38 mm. (1½ in.) in diameter, has a ⅛-in. wall and is locked with a single set screw and cotter pin. There are eighteen 11/32-in. holes drilled in the skirt for lightness and for oiling purposes.

The connecting-rods are of the Renault yoked type, and the short rod alternates from right to left cylinder from the front to the back of the engine. The rods are made of B. N. D. steel I-beam section, with flange and web 2 mm.



Fuselage of a French Boeguet bombing machine with a Renault installed.



On the left, front view of the 300 H. P. Renault, and on the right, front view of the 400 H. P. Renault.

thick. The flanges are 26 mm. (1 3/64 in.) and the web is 34 mm. (1 11/32 in.) wide. In the short connecting-rod both ends of the rod are alike. The length of the rod is 300 mm. (11 13/16 in.). The rod cap is secured by means of three bolts, two of 11 mm. (7/16 in.) diameter and one of 14 mm. (9/16 in.) diameter.

The crankshaft is carried in four babbitt-lined bronze shells, which in turn are secured to ribbed-steel bearing caps.

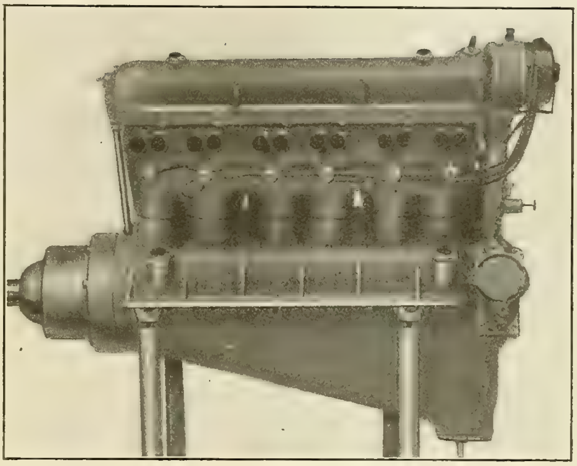
The bearing caps are secured to the top of the case by means of long U-bolts, such as are sometimes used on automobile spring-saddles. The crankshaft has a diameter of 60 mm. (2 23/64 in.) throughout, with the exception of the propeller shaft-end, where the diameter is increased to 68 mm. (2 43/64 in.). The crankpins and bearings are 72½ mm. (2 55/64 in.) long with the exception of the propeller and bearing, which is 92 mm. (3⅜ in.) long.

The shaft is drilled out for lightness, but oil is carried from the main bearings by means of thrower rings and separate small steel pipes to the connecting-rod big-end bearings. The front end of the crankshaft is splined to receive the starting gear and accessory drive. The bottom half of the crankcase serves as an oil-pan and has a screen dividing it into two compartments. The water-pump is mounted at the front of the engine on the bottom half of the crank chamber, and has an especially designed double runner and double collector. The water is piped to both sides of the engine, through copper pipes, and rubber connections are interposed to prevent cracking of joints due to vibration.

The carbureter is of the single float type. Two carbureters are mounted on each side of the engine and bolted to the crankcase by means of long studs. The intake pipes, which are fastened to the carbureter by means of unions, are made of copper tubing 48 mm. (1 57/64 in.) in diameter.

The carbureter has a pair of primary nozzles, a pair of secondary nozzles and an auxiliary air valve, the latter consisting of an annular ring mounted concentrically with a venturi throat.

The oiling system is extremely simple. Oil is carried through cast ducts in the front and rear compartments of the crank chamber to the main bearings. It is also carried from these ducts through two copper tubes up to the overhead camshaft case, passes through the camshaft case and returns down through the distributing gear case to the oil sump.



The 400 H. P. Renault engine.

The valve gear is contained in a light steel tube, carried on the studs from the cylinder head, which is slotted to take bronze cages that form both the camshaft bearings and the rocker-arm mountings. The rocker arms are arranged to multiply the cam motion so that the valve opens 12 mm. (15/32 in.). The camshafts and the driving shaft are driven through straight bevel gears of 12½ mm. (½ in.) face. The inclined shafts which drive the camshafts operate at three times camshaft speed. The high speed of these shafts and the resultant lowering in torque on them allows their weight to be considerably decreased. This arrangement is cheaper and much lighter than that where a train of spur gears is used for driving magnetos and camshafts. Many other aviation engines use bevel gears for driving the camshaft, but few designers seem to have grasped the importance of operating the auxiliary shaft at high speed.

There are four magnetos mounted co-axially, each pair being driven through a spur gear, which in turn meshes with a spur gear which is slidably mounted on a splined magneto drive-shaft. The magneto drive-shaft terminates at its forward end in the sleeve of a bevel gear, and is provided with helical splines, so that when the shaft is moved longitudinally it is also moved angularly. This method of advancing the spark obviates the need for many connections to magneto breaker boxes, and also insures a spark of the same intensity, regardless of whether the ignition is advanced or retarded.

At the front end of the crankshaft is mounted an aluminum six-cylinder air-starting motor, which engages the crankshaft by an overrunning clutch. This air-starting motor has a single inlet and discharge valve for six cylinders, of the rotating disk type. A hand starting gear and the starting magneto drive are also built integral with this starter.

THE LATERAL DIHEDRAL

By WILLIAM R. D. SHAW

An English Aviator's Views on the Old-Established Aeronautic Principles.

This article is intended to bring out two important points:

(1) *In tractor biplanes only the bottom plane should have a lateral dihedral angle.*

(2) *When the principle of the lateral dihedral is being applied in a design, the designer must look to his weight distribution and avoid inclined virtual axes of inertia.* *W. R. D. S.*

NINE text-books out of ten give an erroneous explanation of this excellent principle. At least, that is what the writer finds to be the case in England. The stabilizing principle is not derived from the change in the projected plan area of the wings of an aeroplane as the latter rotates about its horizontal longitudinal axis. The right explanation is this: When the aeroplane becomes canted to one side, it tends to side-slip in the direction of the lower wing. The presence of a positive dihedral angle laterally enables this lower wing to derive a lifting force from the side-slipping velocity. At the same time the outer wing is depressed and the machine stabilized.

A tendency particularly noticeable when monoplanes were in vogue was for the wings to grow outward and upward from the center of gravity. This while it resulted in a smart appearance, was bad practice, because the centre of support became too high, and if the principle of the lateral dihedral is correctly applied the centre of gravity should be above the centre of support. The original Fokker monoplane—not the later copies of the Morane—was distinguished by the absence of any lateral controls, and this machine was admirably flown in gales by a lady as long ago as 1912. The high degree of lateral stability was obtained by a pronounced lateral dihedral angle in conjunction with an unusually high centre of gravity. Much of the rolling which is found in dihedral winged machines is caused by the objectionable little horizontal inward components of the varying air pressure on the wings. By employing a high centre of gravity these components are actually turned to useful purpose by contributing to the stabilizing action. All pendulum action and rolling is eliminated.

Again, in turning the centrifugal force with a high centre of gravity is found most useful in balancing the banking angle of the machine, and in the case of engine stoppage the aeroplane assumes a natural gliding angle. Of course, longitudinally it may be advisable to employ a rather larger tail with the high centre of gravity; this is a moot point.

The European War, in which the writer has had some 18,000 miles flying experience over what Britishers call "Hunland," has developed the tractor biplane as a more or less standard type. One, however, comes across machines of this type in which both upper and lower planes have both a lateral dihedral, others in which only one of these planes has the dihedral, and some having no dihedral laterally at all. Of these, the only type that deserves to survive is that in which only the bottom planes have a lateral dihedral angle. This makes for smart appearance, high factor of safety, and really means that while taking the machine as a whole the centre of gravity is not too high, and while considering only the bottom stabilizing dihedral plane the centre of gravity is high in relation to it. Such aeroplanes one frequently sees, but one wonders whether the designer had this point in mind when he evolved the machine.

It is not generally recognized how important a feature weight distribution is in

(*Continued on page* 790)

NAVAL and MILITARY AERONAUTICS

Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
COL—Commissioned as Colonel, Aviation Section, Signal Corps.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of Military Aeronautics, Washington, D. C.
EEP—Report to Essington Field, Essington, Pa.
ELA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JHU—Report to School of Military Aeronautics, John Hopkins University, Baltimore, Md.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Hampton, Va.
LTC—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Corps.
LTR—Commissioned as Lieutenant-Colonel, Aviation Section, Signal Reserve Corps.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Minn.
REL—Relieved from present duty.
REV—Recently issued order is revoked.
RII—Report to Repair Depot, Indianapolis, Ind.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SPD—Report to Spruce Division, Yeon Bldg., Portland, Ore.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WCW—Report to War College Division, General Staff, Washington, D. C.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note. 1—Report to points named in order mentioned for temporary duty.

Note 2—Report to S. C. Radio General Supply Depot, Atlanta, Ga.

Note 3—Report to S. C. Troops, Camp Green, Charlotte, N. C.

Note 4—Report to O. i/c District Finance Office, Keenan Bldg., Pittsburgh, Pa.

Note 5.—Report to Little Silver, N. J.

Note 6—Report to Camp Jackson, Columbia, S. C.

Note 7—Report to District Manager of Equipment, Detroit, Mich.

Note 8.—Report to Capt. M. H. Grace, Production Dept., Grand Central Palace, 46th St. and Lexington Ave., New York, N. Y.

Note 9—Report to District Manager of Equipment, 480 Lexington Ave., New York, N. Y.

Note 10—Report to Radio School, Austin, Tex.

Note 11—Report to Capt. J. N. Patterson, San Francisco.

Note 12—Report to Fort Kamehameha, Honolulu, Hawaii.

Special Orders Nos. 130 to 134, inclusive

A	
Acheson, Alexander M	TFT
Appleton, James L	TFT
Atkinson, Harold K	TFT
Anderson, Harold	SLR; EOT
Archer, Cecil Elmore	SLR; RSD
Anglin, Charles H	PFO
Anderson, Emil S	MAC
Ammel, Roy W	CWT
Alexander, Wriston G	CJW
Apple, Addison A	FRF
Adams, James S	FRF
Adams, William H	FRF
Aldridge, William Southworth	SLR; LDT
Aven, William Ralph, Jr	SLR; LDT
Austin, Calvin E	FRF
Amberg, Irwin S	FRF
Archer, Allan T	FRF
Austin, Charles B	FRF
Arnold, Ivan Thomas	SLR
B	
Bruch, Louis Mason	SLR; CRI
Bonesteel, William Kenneth	SLR; RSD
Bullock, Edward L., Jr	DMA
Black, Charles N	CFT
Brown, Owen S	FRF; DMA
Brooks, John P	LHV
Barton, Paul W	FRF
Boxell, Earl Francis	SLR; AAD
Berger, Earl O	FRF
Bruce, Parker	FRF
Barnes, Robert Henry	SLR; CWT
Breckon, Leslie Stewart	SLR; RSD
Boothe, William H., Jr	SLR; AAD
Bither, Tom A	MAC
Barnes, Dwight F	CWT
Booth, Harold W	CWT
Bramlette, James L	CWT
Burnet, Gilbert W	CWT
Blackburn, Border	PFO
Braun, William P	PFO
Burrucker, William C	TFT
Buckley, Charles J	TFT
Brofft, Randolph E	TFT
Browne, Charles E	TFT
Burr, Richard O	TFT
Burns, George R	SLR; AAD
Bullitt, Joshua F	DIK
Baum, Frank H	DIK
Buffigton, John F	MAT
Brown, Harold L	SLR; AAD
Brown, Henry J	SLR; AAD
Biddle, Spencer	SLR; VBW
Black, Joseph Loyal	SLR; CWT
Blain, John Dean	SLR; RSD
Bender, Ned J	FRF
Burr, Walter A	FRF
Peehler, George H	DIK
Buser, Albert Ervin	SLR; RSD
Baines, Earl D	DIK
Brannum, Claude J	SLR; DIK
Burrows, Frank H	DIK
Burnett, Hunter T	FLT; DIK
Brew, Paul	TFT
Blackburn, Jack	TFT
Brayman, Kenneth C	DIK
Boucher, Clarence K	TFT
Pacon, Beniam'n S	FLT; DIK
Benjam'n, Everett F	FRF
Barnard, Albert	SLR; AAD
Baum, Frank Hutchins	SLR; KST
Bartholomae, William August, Jr	SLR; AAD
Brady, Cletus J	SMM
Borden, Joseph Louis	SLR; KST

Baker, Harold Henry	SLR; GLC
Bowen, Lewis L.	FRF
Bush, Ralph R.	RSD
Blackburn, Lloyd C.	SMM
Baildon, John K.	SMM
Bartlett, Treffley F.	SMM
Breese, Clinton S.	FRF
Bottom, Raymond B.	LHV
Buckley, Francis J.	SMM
Blackard, Charles G.	SMM
Baxter, Donald K.	CFT
Bisgood, Frederick Whitaker	SLR; LDT
Behel, Vernon W., Jr.	FRF
Beach, Merritt S.	FRF
Birnbaum, Bert J.	FRF
Bliss, Carlton M.	FRF
Braukman, Clarence A.	FRF
Burch, Mark H.	FRF
Boothe, William H., Jr.	FRF
Burns, George R.	FRF
Bauerfeind, Lanus E.	EOT
Bockus, Harry N.	FRF
Brown, Kenneth P.	SLR; FRF; TFT
Baker, Harry Sargent	SLR; EOT
Burdick, Lorence Bushnell	SLR; EOT
Butler, Charles A.	FLR; VBW
Brown, Christy	SLR; DAP
Brown, Fred Le Roy	FLR; DAP
Boyd, George Winn	SLR; RSD
Beck, Daniel H.	SLR; RSD
Bagley, James K.	PFO
Benton, John William	SLR; RSD
Bralley, Ernest Meade	SLR; KST
Brewer, Percy Osborne	SLR; RSD
Brunner, Charles Felician	SLR; RSD
Blodgett, George Raymond	SLR; Note 8
Britton, Ralph R.	DIK
Bradley, Timothy W.	DIK
Burge, Kemp S.	FRF
Buchanan, Thomas S.	FRF
Bernard, Clifford Shaffer	SLR
Bird, Emerson Prall	SLR
Baskerville, Ralph Edwin	SLR

C

Crawford, Russell A.	MAC
Crowdus, Walter C.	FRF
Crane, George A.	FRF
Chaney, James E.	DMA
Codington, Arthur David	SLR; CAF
Caldwell, Frederick Wyllys	SLR; LDT
Chase, Lowell H.	FRF
Calkins, Reginald Jackson	SLR; EOT
Collier, Ralph Phelps	SLR; CWT
Cauthen, James C.	CWT
Cole, Robert A.	FRF; CWT
Cox, Artie G.	CWT
Cundiff, William I.	DIK
Carpenter, Kenneth	SLR; CRI
Carroll, Alonzo Marcellus, Jr.	SLR; EOT
Colliver, Harry Forrest	SLR; AAD
Cartwright, Paul	SLR; AAD
Cohen, John	DIK
Carryl, Frank M., Jr.	PFO
Coffman, Lionel A.	PFO
Corkran, Dudley C.	PFO
Collier, Trezevant	AAD
Cunningham, Samuel D.	DIK
Calley, Charles Deane	SLR; RWT
Clark, Earland F.	SLR; AAD
Coles, Paul D.	TFT
Collier, Ralph P.	DIK
Crehore, John D.	DIK
Chamberlain, Leo W.	SLR; AAD
Carter, John Owen	SLR; TFT
Cooper, Edwin Jonas	SLR; AAD
Clark, John B.	TFT
Chanin, Charles G.	TFT
Crawford, Noble Russell	SLR; TFT; FRF
Cleveland, Waldo A.	DIK
Clark, Arthur F.	DIK
Cutts, George B.	FRF
Clark, Dunlap Cameron	SLR; FOB
Cleveland, Chester Emery, Jr.	SLR; RWT
Claggett, Henry B.	FRF
Croom, Marvin Earl	SLR; CRI
Crook, Wilson Walter	SLR; KST
Coulter, William A.	TFT
Clements, Otis G.	FRF
Charroin, Arthur B.	DIK
Cole, Harold L.	DIK
Conway, James V.	DIK
Croxford, Frank D.	FRF
Chapman, William Burr	SLR; LDT
Carberry, Joseph E.	DMA
Cone, Charles L.	FRF
Comly, John	FRF
Collins, William Frederick	SLR; FOB
Corbet, Clinton Litchfield	SLR; RWT
Cantey, Samuel McGowan	SLR; GLC
Carroll, Earl	FRF
Carter, John O.	FRF
Crocker, Zenas, Jr.	RWT
Cooper, Elmer E.	FRF
Chance, Percival H.	FRF
Clark, William J.	FRF
Coffing, Lawrence D.	FRF
Carscadin, Henry L.	CFT
Christensen, Jens T.	FRF
Costar, Lloyd	SLR; RSD
Chatterton, Walter S.	FLR; DAP
Crozier, George Haynes	SLR; Note 8
Cotton, John Bowman	SLR; RSD
Corbitt, Marsh Morgan	SLR; RSD
Cummings, Charles Milton	SLR; RSD
Croxson, Albert Milne	SLR; RSD
Clayton, George W.	Note 3
Conlogue, John Augustine	SLR; LDT
Clevette, Charles F.	DMA
Conrad, Carl Cecil	SLR; EOT
Chaplin, Winthrop L.	DIK
Childress, Charles W.	DIK
Connor, Richard M.	DIK
Cann, Frederick Bowman	SLR
Clendinning, William R.	Note 10

D

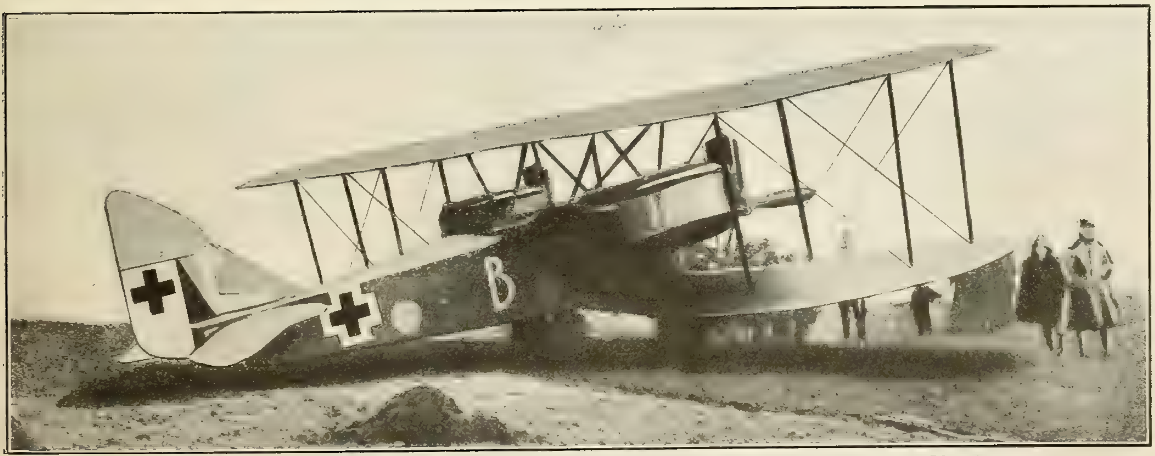
Dahle, Arthur William	SLR; CWT
Davis, Harold Clyde	SLR; CWT
Del Gaudio, Matthew W.	RWT
Denham, Thompson Brooks S.	FRF
Douglas, Bernard M., Jr.	FRF; DIK
Dillaway, Manson M.	PFO
Dinger, Harry A.	MAC
DeVore, Kenneth L.	CWT
Davis, Roy L.	MAT
Delana, Edward K.	TFT
Despain, Lawrence N.	SLR; AAD
Dodds, Harry	FRF
Davidson, Carlton F.	FRF
Dimming, Howard	TFT
Duckett, Thomas P.	FLT; DIK
D'Arcy, James, Jr.	TFT
Daub, Wade Gordon	SLR; EOT
Dickson, Hunter Adam	SLR; EOT
De Lany, Russell Wetzel	SLR; GLC
Daniel, Roy Petery	SLR; RSD
Duke, Daniel Fitzgerald	SLR; DIK
Douglas, Bernard Martin, Jr.	SLR; PMT
Dawson, Charles B.	FRF
Dievendorff, Horton Harold	SLR; RSD
Drougard, Valentine J.	RWT
Dwyer, Martin James	SLR; AAD
Dodge, Walter E.	FRF
Dugger, Eugene F.	FRF
Des Champs, James W.	CFT
Doyle, John C.	SMM
Davis, Donald D.	DAP
Drake, Chester M.	SLR; DIK
Dreher, Raymond C.	DIK
Duke, John F. S.	DIK
Daniels, Julian Sinclair	SLR
Dorner, Earl Victor	SLR
Dougherty, Elmer Lloyd	SLR
Duncan, John Collins	SLR
Dixon, Rollin Lester	SLR
Dreher, Harland Brown	SLR

E

Ebright, Carroll Malcolm	SLR; RSD
Eastman, Byron Lee	SLR; RWT
English, Connell A.	DIK
Ellery, Eugene, Jr.	SLR; CRI
Emley, Ivan N.	MAC
Ennis, Arthur I.	DIK
Egan, Thomas M.	DIK
Erickson, Harold	SLR; DIK
Erickson, Fridjof C.	SLR; DIK
Eustis, Edwin M.	TFT
Everett, Aylett Lee	SLR; RSD
Elbart, Earl Walter	SLR; KST
Emerson, Sumner Brooks	SLR; FOB
Erlendson, Pjetur	SLR; EOT
Elsey, George W.	FRF
Eddy, John Leslie	SLR; TFT; FRF
Elliott, Marion L.	FRF
Edler, Raymond C.	FRF
Ewing, Henry G.	FRF
Egbert, Perry T.	DIK
Eccleston, Henry B.	SMM
Edwards, Claude R.	SMM
Eyman, Bradford	FRF
Edwards, George Boardman	SLR; Note 8
Ellyson, James Kemper	FLR; DAP
Evans, Edward Lawrence	SLR; DAP
Eldridge, Royal Arthur	SLR
Etnyre, Mentor	SLR

F

Fulwiler, Howard D.	SLR; KST
Fenton, Daniel H.	SLR; RTR
Fulwood, Charles Wesley, Jr.	SLR; RWT
Fry, John Oscar	SLR; CRI
Fields, Frank Eugene	SLR; KST
Fauvre, Irving Maus	PFO
Foreman, Carrol L.	DIK
Fox, Arthur W.	CWT
Fenno, Jesse K.	MAC
Farrell, John B.	DIK
Fitzhugh, Thomas C.	BST
Frankfort, Frederick	FRF
Foster, Arthur L.	MAC
Fuller, Robert N.	SLR; AAD; FRF
Farrar, Delwin B.	PFO
Fause, Leroy H.	DIK
Fitzgerald, John J.	FRF
Fish, Eugene R.	PFO
Ferguson, George F.	FRF
Farnsworth, Augustus P.	TFT
Frost, John W.	TFT
Fay, George H.	DIK
Fitzgerald, Harold Alvin	SLR; TFT
Farthing, Welbourne Owens	SLR; KST
Few, Lindsey D.	FRF
Farris, Homer Virgil	SLR; RSD
Frost, John Austin	SLR; RSD
Farnum, William Cushman	SLR; FOB
Frisbie, Hallet Burtrand	SLR; EOT
Frankley, Lawrence William	SLR; RSD
Foster, Roy W.	RSD
Fillmore, William H.	FRF
Ferris, Walter Cutler	SLR; Note 8
Frank, Stuart H.	DAP
Frindel, Samuel, Jr.	DAP; Note 2
Flather, William James	SLR; MDO
Ford, Lewis E.	DIK
Ferris, George M.	DAP
Frandsen, Arthur S.	MAT



A German Gotha captured by the French Air Service in the environs of Paris. (French Official Photo)

Fall, Harold Andrews	SLR
Flinn, Earle Frank	SLR
Ford, Lewis Eastman	SLR
Fraser, Walter	SLR
Frink, George Willis	SLR

G

Gheen, Raymond Fearson	SLR; CWT
Gay, Ernest Hubbard	SLR; RWT; FRF
Givens, James Douglas	SLR; AAD
Gibson, James R.	TFT
Griffith, Fred C.	TFT
Grimes, Gerald E.	TFT
Graicunas, Vytautas A.	TFT
Grosh, Emmett K.	WFO
Goree, Jonathan D.	SLR; AAD
Gooding, Carlos C.	DIK
Grady, Harold H.	DIK
Gibson, Peyton	FRF
Greer, John E.	FRF
Ghee, Milton P., Jr.	DIK
Green, Dwight H.	DIK
Gordon, James B.	SLR; AAD
Garesch, Claude F.	DIK
Grasse, Carl A.	FRF
Giddings, Joseph A.	FRF
Gilman, Harold A.	FRF
Gormley, Richard R.	FRF
Graven, Carl M.	FRF
Gunn, Roy E.	FRF
Golonsbe, George J.	FRF
Graham, Charles, Jr	FRF
Goode, Henry Walton	SLR; RSD
Griffin, James L.	FRF
Grady, Henry L.	FRF
Graven, Carl M.	DIK
Gordon, Charles	Note 6
Goodnow, Wallace Field	FLR; CMV
Goble, Amos Howard	FLR; Note 7
Gale, James Cloyd, Jr.	SLR; RSD
Gallup, Burton A.	DIK
Gilbert, Charles T.	DAP
Gandy, Robert L.	FRF
Goree, Rogers C.	FRF
Goldsborough, William C.	MAT
Graham, Harland Brown	SLR
Graham, Audrey William	SLR
Gilchrist, Hugh Robert	SLR

H

Haddock, James Perry	SLR; RSD
Halley, Harold A.	FRF
Hockett, Roland R.	FRF
Harding, Roy Edmond	SLR; RSD
Herrmann, Gerald Francis	SLR; RSD
Hersleff, Sigurd N.	DIK
Hereford, Herbert W.	FRF
Hough, Roscoe R.	SMM
Huffman, Carl F.	CFT
Halsey, Oscar Lawrence	SLR; DAP
Hawks, Horace Gilmour	SLR; KST
Hopkins, Edward James	SLR; KST
Hogue, Mark Campbell	SLR; RSD
Hayes, Perry	SLR; CWT
Heath, Edward Phillips	SLR; CWT
Hoffman, Malvin Gerald	SLR; KST
Hunter, Archie Dean	SLR; KST
Holmes, Henry K.	Note 4
Hall, Edwin P.	DIK
Hunt, Gilman Charles	SLR; CWT
Harris, Allan B.	MAT
Hostetler, Wilbur D.	MAT
Hyland, George N.	MAT
Hyde, Jules V.	DIK
Haggerty, Lyman Hale	SLR
Howard, Lynn Frederick	SLR
Howard, Raymond Edward	SLR
Hendrickson, Charles G.	Note 12
Henderson, Paul Raymond	SLR; KST
Hands, Stanley Moore	SLR; CRI
Henry, Percy Claney, Jr.	SLR; RSD
Haney, Wayman	MAC
Hardie, John F.	PFO
Harrington, Henry G.	PFO
Hurd, Mark M.	PFO
Hebbard, Charles B.	DIK
Harvey, Harold M.	FRF
Hoyt, Fred D.	MAC
Hooper, James Clinton	SLR; KST; FRF
Heffner, Paul	SLR; AAD
Hadley, Lawrence Burton	SLR; AAD
Heafer, Harold W.	TFT
Hebberd, James L.	TFT
Himebaugh, Gero A.	TFT
Hoefgen, Leonard E.	TFT
Hooper, Harley L.	DIK
Hickmott, John T.	FRF
Horrell, Camden R.	TMA
Houlton, Raymond C.	DIK
Harwell, Gordon L.	MAT
Headley, Mervin E.	DIK
Hogland, Alander F.	MAT
Harkins, Samuel W., Jr.	MAT
Hart, John F.	CWT
Holmes, Robert B.	CWT
Haywood, Chester B.	FRF; DIK
Hayden, Max Ernest	DIK
Haserot, Francis Samuel	SLR; CWT
Helmerich, Walter Hugo	SLR; KST
Helgesson, Henry Theodore	SLR; RSD
Hellman, Richard Hoge	SLR; RSD
Harpel, Gates	SLR; EOT
Harris, William L.	FRF
Hackett, Frank D.	MAT
Hickman, Horace M.	FRF
Holladay, Daniel M.	TFT
Hood, Daniel G.	TFT
Haddorff, Carl L.	DIK
Harpham, Edwin Lynn, Jr.	SLR; KST
Henderson, Jacob Earl	SLR; TFT; FRF
Hill, John P.	FRF
Howard, Thomas D.	FRF
Hoyt, Werner Fletcher	SLR; RSD
Howard, Harold Harmon	SLR; RSD
Hotchkiss, Edward Gillette	SLR; FOB

I

Inlow, Walter Thomas	SLR; CWT
Ingraham, Forrest W.	PFO
Ingle, Joseph L.	TFT
Ingersoll, Hamilton	RWT
Innes, William Wallace	SLR
Isbell, Henry W.	Note 6
Ingraham, Elmer Clarke	SLR

J

Jaynes, John Belmont	SLR; EOT
Jones, Stanley B.	FRF
Johnson Courtlandt S.	CWT
Jones, Elmer H.	CWT
Jackson, Joseph W.	TFT
Johnson, Joseph K.	TFT
Jacobs, George S.	DMA
Jones, Lawrence M.	DIK
Jones, Clifford E.	PFO
Jaccard, William N.	SLR; AAD
Jenkins, Nelson D.	DIK
Jaggard, Robert Kenneth	SLR; KST
Jacomini, Clement, Jr.	SLR; RSD
Jones, Ira Milton	SLR
Jennings, George A.	FRF
Jones, Theodore C.	MAT
Johnson, Laurence S.	FRF
Jaques, Gordon F.	CAF
Jacquemart, Eugene Arthur	SLR; RSD
Jones, Paul	FLR; DAP
Jack, Butler, Jr.	MAT
Jaenke, William D.	MAT
Jones, Howard H.	DIK
Jennison, John C.	SLR; DIK
Johnson, Victor H.	DAP
Jenkins, Ned Walter	SLR
Jacobs, John Frank	SLR
Jones, Vivian Maxwell	SLR
Justice, Philip Syng	SLR

K

Kiely, Daniel	DIK
Kinney, Morris	TFT
Kier, Samuel Max	SLR; AAD; FRF
King, Charles D.	DIK
Knupp, Glenn H.	SLR; FRF; AAD
Kindig, Theodore P.	TFT
Knerr, Hugh J.	GLC
Kirby, Samuel Bonner, Jr.	SLR; KST
Kelly, Harold R.	CFT
Klingensmith, Ward C.	DIK
Kelly, Bernard H.	PFO; FRF
Kinder, Roland H.	SLR; AAD
Knox, Merton Hugh	SLR; KST
Kelly, Ralph Morse	SLR; RSD
Kingman, Spencer S.	MAT
Keeler, John F.	SLR; FRF; AAD
Kramer, George E.	SLR; EOT
Kendrick, Aaron T.	FLT; DIK
Kloke, Carl P.	SLR; DIK
Kittell, Mellon F.	TFT
Knickel, Walter Clayton	SLR
Kohr, Hugo John	SLR
Kiefner, Charles E.	CFT; FRF
Keeling, Walter S.	CFT
Kinney, Judson S.	FRF
Kauffman, Carl R.	FRF
Kent, Thomas T.	FRF
Kennedy, William Edward	SLR; TFT; FRF
King, Alexander M.	FRF
Keith, Jerome	FRF
Halloran, Earl T.	FRF
Knapp, Robert D.	FRF
Kuhlke, John R.	SLR; KST
Kennedy, Robert Joseph	SLR; DAP
Kennedy, Robert Emmett	SLR; KST
Kievlan, Charles Edgar	SLR; EOT
Keohane, John Michael	SLR
Kinney, Charles Lafayette, Jr.	SLR

L

Lynch, Frederick Dan	SLR; CRI
Lile, Richard Leon	SLR; ELA
Lees, Herbert C.	TFT
Lobdell, Jacob K.	TFT
Loud, Harold E.	TFT
Littlefield, Robert Clement	SLR; KST
Lowell, George Clough	SLR; RSD
Longstroth, Marshall	MAC
Laubenfels, Clarence R.	DIK
Long, William F.	DIK
Loder, James Augustus	SLR; RWT; FRF
Lowenstein, Milton D.	SLR; AAD
Lipscomb, McDonald E.	TMA
Lawton, Merritt L.	SLR; DIK
Laird, Homer U.	FLT; DIK
Locher, Edward O.	DIK
Leib, William F.	SLR; DIK
Lenoir, Whitman Hill	SLR; FRF; DIK
Locher, Edward Orrick	SLR
Logan, William Lindsey	SLR; DIK
Lyman, Richard Sherman	SLR
Lewis, Harold McQuade	SLR; KST
Liggett, Arthur G.	FRF
Leonard, John Lawson	SLR; FRF; RWT
Lundgren, Theodore S.	FRF
Lansing, Jack C.	FRF
Levitt, Morse D.	FRF
Lansing, Jack Courtney	SLR; TFT
Lewis, Richard P.	SMM
Lownsberry, Guy T.	FRF
Lavelle, Michael J.	SMM
Long, Carl C.	SMM
Lindsley, Dan Leslie	SLR; RSD
Lawson, William Eric	SLR; RSD
Leonard, Cecil Ebenezer	SLR; RSD
Lisenbee, George M.	DAP
Lamb, Howard E.	SLR; DIK
Lister, Harold Reid	SLR
Lund, Paul Svenny	SLR
Lundgren, Edgar Emanuel	SLR
Lathrop, Charles Gillette	Note 11

M

Midyette, Dayton Ralph, Jr.	SLR; RWT; FRF
Martin, David M., Jr.	TFT

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Kamesaburo Yamashita, a Japanese multi-millionaire, who recently demonstrated his patriotism by presenting to the Japanese Government one million yen to be used for the purchase of aeronautical equipment. (Japanese Official Photo)

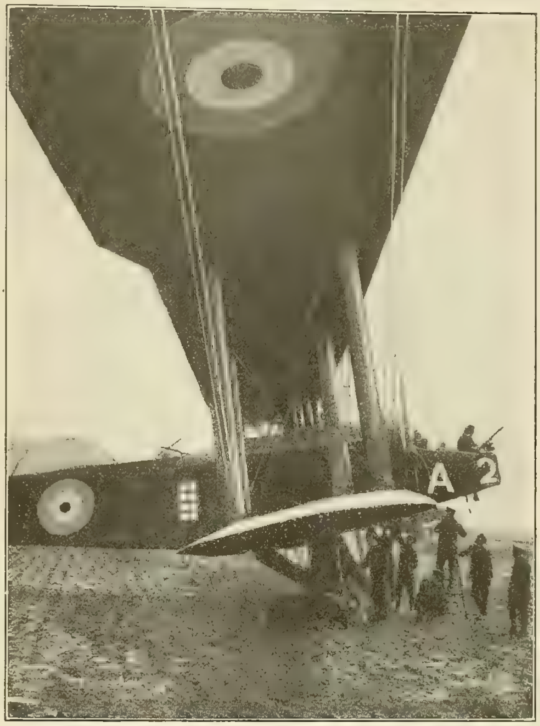
Maxwell, Maurice F.	TFT
Miller, Rolfe T.	TFT
Mitchell, Raymond A.	TFT
Marschak, Isidor	SLR; RWT
Madden, John H.	CWT
Milburn, George J.	CWT
Miller, Frank M.	PFO
Manning, Lucius	MAC
Murray, Charles Bellan	SLR; CWT
Morison, James C.	TFT
Moses, Lester E.	TFT
Minter, Clark C.	DMA
Mills, Robert R.	SLR; AAD
Miller, Henry B.	SLR; DIK
Miller, William F.	DIK; FRF
Marshall, Furber I.	SLR; AAD
Morris, Harley	SLR; AAD
Monteith, Percy L.	DIK
Murphy, Ralph Joseph	SLR; AAD
Metcalf, Frank	PFO
Maitland, Lester James	SLR; RWT
Morris, David Benjamin	SLR; RWT; FRF
Murphey, Harvey William	SLR; AAD
Moore, Robert G.	SLR; FRF
Matthews, David Robert	SLR; RSD
Moore, Maurice H.	FRF
Midkiff, Robert Forrest	SLR; KST
Mihleder, Philip George	SLR; TFT; FRF
Mahoney, Frank Herbert	SLR; EOT
Magna, Joseph Nicholas	CPR; CSO
Marshall, Charles Clark	SLR; TFT; FRF
Marshall, Howard Pearons	SLR; TFT; FRF
Mansell, Isaac E.	FRF
Miller, Lester J.	TFT
Mahon, William L.	DIK
Manning, Lucius	SLR; RSD
Martin, Robert	FRF
Mathews, John J.	FRF
May, Elmer N.	FRF
Mellor, Lloyd E.	FRF
Metcalf, Arthur B.	FRF
Moore, Harold Amos	SLR; RSD
Moores, Kenneth Albert	SLR; RSD
Mapes, Gordon Walter	SLR; LDT
Marsh, Edgar Clark	SLR; RWT
Marshall, William Jefferson	SLR; RSD
Moon, Odas	FRF
Mackie, Perle	FLT; DIK
Meyer, Emil A.	CFT
Miller, Marion Lewis	SLR; CWT
Morris, Charles G.	DIK
Murphy, Charles S.	FLT; DIK
Morgan, Herbert P.	FRF
Munson, Clinton G.	SMM
Morsch, Jesse Julius	SLR; RSD
Muckley, Robert Latour	SLR; CWT
Miller, Samuel H.	REL; CSO
Marsh, Albert E.	MAT
Mess, Robert W.	MAT
Mulvihill, Mead J.	MAT
Martel, Alfred, Jr.	SLR; RSD
Manselman, Earle H.	SLR; DIK
Murray, H. Sinclair	DIK

Mc

McDonald, Samuel F.	PFO
McCall, Carlton C.	TFT
McHenry, Arthur J.	TFT
McElin, Bertrand J.	DIK
McNamara, Lawrence Joseph	SLR; RWT
McLaren, William B.	MAT
McNaught, Roy J.	DIK
McDonald, James F.	FRF; DIK
McKay, Woodrow	DIK
McAllen, William Daniel	SLR; RSD
McCabe, Roscoe Ellis	SLR; RSD
McCulloch, John Myers	SLR; RSD
McMullen, Alexis Brenier	SLR; RSD
McClory, Harry G.	DIK
McAuliffe, William F.	FRF
McCoy, Dell H.	FLR; DIK
McNaught, Roy J.	FRF
McLaughlin, Oscar F.	CAF
MacDowell, Bruce A.	LHV
McBride, Howard I.	FRF
McLellan, Hiram J.	FRF
McMurphey, John W.	FRF
McKenna, Edmond P., Jr.	FRF
McFarland, John J.	FRF
McCabe, Alfred S.	DIK
McGovern, John E.	MAT
McKinney, Oakley Walls	SLR; EOT
McCrillis, Jacob Wilson	SLR; RSD
McMillin, Henry Everett	FLR; DAP
MacMechan, Dunbar Deane	SLR; LDT
MacLaren, Clyde Athol	FLR; CMV
McQuiston, Rolla Hunter	SLR; DAP
McRae, Harry Botsford	SLR; CWT
MacLeod, Norman Langley	SLR; WDM

N

Niblack, Polk Howard	SLR; RSD
Norton, Rolla W.	FRF
Nethercut, William R.	DIK
Niles, Edward A.	MAT
Nissager, Fred D. M.	DIK
Nunenmacher, Francis Warren	SLR; RSD
Nietz, Adolph H.	FRF
Nealy, Forrest H.	TFT
Nunn, Theodore W., Jr.	DIK
Nims, Homer Willis	SLR; RSD
Nulsen, Norman Lee	SLR; CWT
Nash, Roland Lewis	SLR; KST
Norris, James K.	FRF



A British Bombing plane being tuned up and loaded with bombs on the eve of making a bombing raid into Germany. (British Official Photo)

Neely, John H.	FRF
Neely, Eugene A.	DIK; FRF
Nunn, William Theodore	SLR; RWT
Neal, Marshall S.	FRF
Nelb, Alfred W.	FRF
Newman, Robert E.	FRF
Nissager, Fred David	SLR; HHN

O

O'Brien, James H.	DIK
O'Neil, Joseph H.	CWT
O'Leary, Max	SLR; RWT
Otis, Edward G.	MAT
Osborn, Thomas W.	SLR; AAD; FRF
Organ, John David	SLR; KST
Ogilvis, Alexander E.	DIK
Owen, Ross G.	DIK
O'Malley, Edward Lewis	SLR; CWT
O'Briant, Luther	SLR; CWT
Oliver, Walter Lloyd	SLR; RWT; FRF
Ordway, William F.	FRF
Oakes, Gail C.	SMM
Olds, Harvey R.	MAT
O'Hanley, Myron Emmett	SLR; RSD
Ober, George Billings	SLR; EOT

P

Peirce, Gowen	SLR; RWT
Putnam, Russell Lorain	SLR; PMT
Palmer, Hubert Phillips	SLR; KST
Pace, Floyd A.	PFO
Philbrook, Jacob B.	TFT
Palmer, Walter	TFT
Parker, Albert N.	TFT
Perry, William L.	TFT
Parks, Ralph O.	FRF
Palmer, James E.	MAC
Pearson, Wallace D.	SLR; AAD
Phillips, Walter P.	DIK
Parrott, William G.	MAT
Pilcher, Rufus J.	CWT; FRF
Philips, Enoch Anderson	SLR; RWT
Pennington, Jerome E.	FRF
Pinkstaff, Everett W.	FRF
Purcell, William L.	TFT
Paine, Grosvenor R.	DIK
Porter, Louis H.	DIK
Pollard, Thomas G.	DIK
Parish, Cheaney Land	SLR; RSD
Payne, Bryan Watson	SLR; RSD
Parker, Reed Lynn	SLR; MDO
Prosser, Stuart Alexander	SLR; TFT; FRF
Paine, Topliff Olin	SLR; AAD
Paegel, Hollis Arthur	SLR; CWT
Powell, Charles S.	FRF
Pemberton, George Herbert	SLR
Petticord, Leslie L.	CFT
Peterson, Tenny C.	SMM
Payne, Halbert Edwin	CPR; DAP
Purdy, Donald F.	SRC
Patrick, Charles Colin	SLR; DAP
Pratt, Henry C.	FRF
Pieron, Anton	SLR; CSO
Price, Henry Wales	SLR; CWT
Page, Henry L.	DIK
Pfeifer, Carl B.	DAP

Q

Quinlan, Charles G.	DIK
Queen, Harold E.	MAC

R

Robertson, Archie Mac Intyre	SLR; CRI
Robinson, Clarence Abraham	SLR; AAD
Reilly, Walter S.	FRF
Robinson, Frederick A.	SLR; AAD
Rough, Howard F.	MAC
Ross, Leslie H.	RWT
Richards, Walter Eugene	SLR; RSD
Reavis, Carlos Loretto	SLR; RSD
Ronan, John A.	SLR; AAD
Ray, Paul M.	TFT
Reiss, George S.	TFT
Ristig, William B.	TFT
Roby, Townsley N.	TFT
Royce, Walker W.	TFT
Russell, Emerson C.	TFT
Ratliffe, George T.	TFT
Romans, Edgar D.	FRF; DIK
Richman, G. Raymond	MAC
Rowe, Harold D.	FRF; DIK
Riddle, Earl G.	PFO
Ransom, Harold B.	DIK
Rice, William T.	VBW
Reges, Charles H.	FLR
Reber, Alvin D.	FRF
Read, James K.	FRF
Ryniker, Milton E.	SLR; DIK
Rentfrow, Frank M.	DIK
Rowe, Ralph S.	TFT
Redfield, Alfred W.	TFT
Roberts, Gerald I.	DIK
Rossiter, Edner M.	DIK
Ryan, John Newman	SLR
Royer, Walter Earle	SLR; EOT
Root, Homer Boice	SLR; RSD
Ratekin, Otis Benjamin	SLR; EOT
Ratcliffe, Kent E.	SLR; RSD
Reynolds, George H.	FRF
Ryan, Robert	SLR; CWT
Rabbitt, Ora Clyde	SLR; LDT
Rollins, Carson W.	CFT
Roberts, Roscoe O.	SMM
Rummel, Jay Arnold	SLR; CWT
Ridley, Oscar T.	SMM
Robertson, Arthur	SMM

(*Continued on page 793*)

FOREIGN NEWS

FRANCE

The French official for June 14th says:

"Our chasing air squadrons have brought down five aeroplanes and two captive balloons. Seven other German machines have been put out of action.

"During the night of June 13-14 our bombing squadrons dropped on establishments, stations and cantonments in the enemy zone nineteen tons of explosives, causing important damage."

The inauguration of aerial postal service between Paris and London resulted in a tragedy, when Capt. Pierron, the famous French airman, and Lieut. Rousseau were killed at Hounslow while flying from France.

They had almost reached their destination when for some unexplained cause the machine suddenly crashed to the ground.

On June 16th Sub-Lieutenant Nungesser celebrated his promotion as an officer of the Legion of Honor by bringing down two three-seated aeroplanes, making his total of enemy machines worsted in battles thirty-eight.

The French War Office announcement issued June 17th says:

"In the last five days thirty-two enemy machines have been brought down or compelled to land out of action. Four German aeroplanes were brought down by our anti-aircraft guns, and three captive balloons were set afire. During the same period twenty-two tons of projectiles were dropped by day and night on the stations at Soissons, Roye, Nesle, and Chaulnes."

Adjutant Quette, the French aviator, who has downed ten German aeroplanes, has been missing since June 5. He was officially proclaimed an ace June 4.

The War Office announcement of June 19th says:

"There was no event of importance during the course of the day.

"On June 18 our air squadrons brought down or put out of action six German aeroplanes and set fire to one captive balloon. Our bombing machines dropped ten tons of projectiles last night on railway stations, cantonments and bivouacs in the region of Villers Franqueux, Faverolles and Fismes."

The Germans have attempted fourteen air raids upon Paris since January 31, but only twenty-two of the more than three hundred machines which took part in them have succeeded in flying over the city, according to a record of the enemy efforts published in the Excelsior of June 19th.

The newspaper comments upon the effectiveness of the aerial defenses of Paris thus indicated. Nine of the twenty-two machines which penetrated the barrier, it adds, were brought down by the French defenders of the capital.

Eight hundred and thirty-five German aeroplanes have been destroyed since January 1, according to an official statement which has just been issued by the French on June 20 and which tends to prove that the German communiqués are not reliable when dealing with losses of aeroplanes.

The statement says that on June 2 the Germans lost forty-eight, while on June 9 and 10 there were forty-nine of their machines brought down. The British were responsible for the destruction of thirty-three of those lost on the latter date.

The German official statements acknowledged the loss of ten on June 2 and eight on June 9 and 10.

The monthly losses during the present year follow: January, France 20 and Germany 78; February, France 18 and Germany 79; March, France 50 and Germany 186; April, France 46 and Germany 136; May, France 60 and Germany 356.

GERMANY

The German official for June 14 says:

"Twenty-eight enemy aeroplanes were shot down yesterday. The losses of the enemy's air forces on the German front for the month of May amount to twenty-three captive balloons and 413 aeroplanes. Of the aeroplanes 223 fell behind our lines and the rest on the other side of the enemy's positions. We have lost in air fighting 180 aeroplanes and twenty-eight captive balloons."

The German statement for June 16 says:

"Twenty-eight French and British machines were shot down by the Germans Thursday.

The official communication from German General Headquarters on June 18 says:

"Eight enemy aeroplanes and eight captive balloons were brought down yesterday."

June 19th's report from German General Headquarters says:

"Twenty-three enemy aeroplanes and three captive balloons were shot down yesterday."

GREAT BRITAIN

The report issued by the War Office on June 14 dealing with aerial operations reads:

"On Thursday low clouds and poor visibility impeded work in the air, but our machines took advantage of spells of clearer weather to make observations for artillery fire and to carry out numerous patrols and reconnaissances. Nine tons of bombs were dropped by us on the Zeebrugge mole, on the Armentieres and Comines stations and on targets in the French battle area.

"Ten hostile aeroplanes were destroyed during the day and two were driven down out of control. In addition, a German balloon was brought down in flames. We lost five machines. A heavy mist prevented flying during the night."

The British report of June 16 says:

"On June 15 and 16 the Royal (British) air force dropped more than 300 bombs and fired more than 25,000 rounds of machine gun ammunition on troops and transport attempting to cross the Piave."

The official report for June 17 on the work of the British airmen says:

"The uncertain weather interfered with our operations Sunday. The enemy aircraft were active at times on the northern portion of the British front and in the French battle zone.

"Eleven hostile machines were destroyed in air fighting; nine were disabled and one German balloon was shot down in flames. In addition, one hostile machine was shot down and another driven down out of control by anti-aircraft fire.

"We lost ten machines Sunday, six of which were working south of Montdidier.

"We dropped twenty-two tons of bombs by day and twelve tons Sunday night, heavily attacking the railways at Armentieres, Estaires, Comines and Courtrai and the docks at Bruges. Two of our night-flying machines failed to return."

According to the report of June 17 the Royal Air Force in bombing operations into Germany severely damaged military targets at Thionville, Metz-Sablons, and other points, says an official summary.

The railway station and sidings at Thionville, were attacked four times and several direct hits were made on the station. An explosion was caused near the Carlshutte works there. Two attacks were made on Metz-Sablons and a train there received a direct hit. Some three and a half tons of bombs were dropped on the railway sidings at Karthaus and the railways and munition factories at Hagendingen and Dillingen.

All British machines returned safely from all the expeditions.

The British official report says:

"On June 17 the enemy's machines were active on the northern portion of the British front, and there were many combats in the air, in the course of which we destroyed twenty-five German aeroplanes and drove three down out of control. One hostile balloon was shot down in flames.

"The usual observation and photographic work was carried on by our aircraft until stopped by thunderstorms in the afternoon.

"Twenty tons of bombs were dropped during the day on the enemy's railway stations, junctions, dumps and aerodromes, and a further nine tons the following night. Five of our aeroplanes are missing.

"Extensive damage also was done by our seaplanes in the period between June 13 and June 16. The docks at Zeebrugge, Ostend and Bruges, the Thourout Railway station and aerodrome, the Ghistelles aerodrome and the Bourgeoise works at Aertrycke were targets for bombs dropped by the aviators.

"Good results were obtained and hits were observed in the Chasse Basin, the railway station, the docks, the Leopold Basin, the Frederick Battery and the lock gates at Ostend. Fire was started in buildings at the junction of the canal and the Leopold Basin.

"Bursts were also observed on the mole at Zeebrugge and near the lock gates. At Bruges bursts were seen on the northeast quay, alongside the west basin, on the northern floating wet dock, on the east side of the dock and between the north and east quays, as well as at the south end of the east basin. The railway at Thourout was also hit.

"Bombs were dropped on an enemy vessel. During the same period, notwithstanding unsuitable weather, the aerial fleet was active in home waters in anti-submarine escorting and in aircraft patrol. Hostile submarines were sighted by the seaplanes, aeroplanes and airships, which also attacked enemy mines and destroyed them. Allied and neutral shipping was also convoyed by the aerial fleet."

The official statement on aerial operations issued June 19 says:

"It was cloudy Tuesday, but we were able to get observation. In the air fighting we destroyed fifteen German machines and disabled five. Eight of ours are missing.

"Nineteen tons of bombs were dropped in the course of the day. A heavy rain at night prevented flying."

The entrance to Zeebrugge harbor is blocked, according to Lieuts. George Coward and John Read, of the British Royal Air Force, who landed in the province of Zeeland and are to be interned at The Hague.

In an interview published in the "Telegraaf" they say the Germans are working day and night to clear the passage, but each night British aviators demolish the Germans' progress.

The cement ships sunk in the harbor are still there and the Germans are afraid to blow them up for fear they will also destroy the sluices. The lieutenants assert that no submarines can enter or leave Zeebrugge. The blockade of Ostend is not so complete, but the Germans are having great trouble there.

The Peerage of the United Kingdom has been conferred to Sir William Weir, Secretary of State for the Air Forces, according to an official announcement.

Sir William was appointed Secretary of Air Forces last April in succession to Lord Rothermere, brother of Lord Northcliffe. He previously held the post of Director General of Aircraft Production, and at one time was Scottish Director of Munitions. He is forty-one years old.

The British report aerial operations on June 20 as follows:

"A British squadron while on reconnoissance north of Helgoland Bight on the morning of June 19 was attacked by German aeroplanes. No hits were made by the enemy. One enemy seaplane was brought down and destroyed by gunfire.

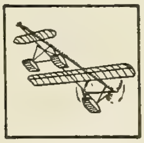
"Low clouds and rain interfered with flying and the enemy aircraft showed little activity.

"Nine German machines were destroyed during the day and two were driven down out of control. One of our machines is missing."

The admiralty on June 14 issued the following official statement on naval aerial operations:

"During the period of June 10-12 the operations of our air force contingents have been attended by unfavorable weather. In addition to the usual patrols, bombing operations were carried out day and night against Zeebrugge, the Bruges docks and the Ostend docks. In all eighteen tons of bombs were dropped. Two hits were observed on the Mole and bursts on the seaplane shed at Zeebrugge and at Bruges. Fires were caused at several places. Hits also were observed at the Brugeoise works, and bursts were observed at the Bassin de la Marine and the Gare Maritime, Ostend. Clouds at times prevented observation. One enemy aircraft was destroyed. One of our machines is missing."

MODEL NEWS



Edited by John F. McMahon

Model Aeroplane Building as a Step to Aeronautical Engineering

WE will now turn to the twin propeller "Pusher" model, known to Model Flyers as the long distance racing type. The model is best suited to our course, because on account of its long flights it allows us to study the aeroplane in the air.

This type differs from the Tractor as to shape and ease of control. The balancing of this model is easier to overcome than any other type, because, in order to locate the centres of lift, etc., properly, it is only necessary to give a greater or lesser angle of incidence to the front plane, which is known as the elevator. From this we see that we need not move the planes to balance the machine.

Of course, this is the easiest way, the better way would be to arrange the planes at different points until the most efficient combination has been worked out using as little angle of incidence as possible, because a greater angle would present a greater area of resistance to be overcome.

So, for the reasons mentioned above, this model is the most popular with Model Flyers. Some, more experienced Model Builders, detest the idea of using their time to the building of the racing type because it does not resemble the large machines, but I think this is a rather foolish way to look at it, because a long distance flying model not alone gives a good chance to study areoplane flight but gives a good amount of enjoyment.

There is no prettier sight than a racing model high in the air traveling in a straight line to the farthest point, driven by its simple rubber power, and after power has gone the graceful glide, sometimes in large spirals, back to earth.

The construction of the racing model varies but little from the other type, the frame is constructed much the same as the tractor, only one end is separated by a strip of wood which the two propellers are mounted.

The frame is a sort of "A" shaped, the long sticks are 36½″ long and made of 5/16″ x ¼″ spruce. One end of each stick is cut at an angle as shown in the drawings, a notch being cut out of the other ends.

Now bend a piece of wire to the shape shown at Figure 3. This is the terminal for the attachment of the rubber motors.

Bind the sharp ends of the sticks and the hook together in one operation with strong linen thread and glue as shown in the enlarged sketch.

The strip of wood for the propeller hanger is next put in place, this strip is 12″ long and ½″ wide at its widest point and tapering to ¼″ at the ends. The thickness of this strip is ⅛″. It is fastened with thread and glue. Next, put the cross strips of bamboo in place at about the center of the frame. These are made of strip bamboo about ⅛″ thick and are for bracing the frame.

The bearings for the propellers are next made from 2 pieces of 1/16″ inside diameter brass tubing ¾″ long and two pieces of thin brass about ¼″ x 1¼″. (The long prongs of a brass paper fastener may be used for this purpose.) Now bend the brass strip and solder to the tubing as shown at the top view, left hand side of the drawing.

Soldering is not as hard a job as most model flyers believe, and if the reader has had no experience in this line he had better start doing so at once because the Compressed Air and Steam Motors coming later cannot be constructed without a good deal of careful soldering, and as the soldering of these bearings are easy, compared to the harder work to come, I would advise beginning now.

I would suggest the model maker procure an alcohol lamp (made for soldering) a can of soldering paste and some soft strip solder.

To solder two objects together, it is necessary to clean the parts thoroughly first, by scraping with a knife or file, applying some paste to the parts to be joined. Next take the alcohol lamp in the right hand and solder in the left, apply the point of the flame to object to be soldered, when sufficiently heated touch with solder and it will run into place, making a strong joint.

It is best to lay the object on a piece of wood, because if laid on metal it might become soldered together. To do good soldering it is only necessary to be careful not to burn the metal and not to use too much solder. It is surprising what good work can be done after a little practice.

When finished, fasten the bearings in place on the ends of the propeller hanger, as shown in sketch at left of drawing.

The wings are made much the same as the wings for the Tractor model, the only difference being instead of a spruce entering edge this one is of bamboo with a spruce spar through the center ¼″ x ⅛″.

The large wing is 24″ long and 5″ wide, the small one 12″ x 3″. When finished cover with china silk or paper and dope with a solution of celluloid dissolved in banana oil. This solution not alone shrinks the fabric but fills the pores as well.

The propellers are cut from a blank 12″ long 1¼″ wide and 1¼″ high, as shown at the lower right hand of the drawing. This is the high pitch type and is cut as described in the instructions for propeller carving, as shown previously. When carving the propellers be careful to cut one to turn one way and the other to turn the reverse.

The motor consists of 16 strands of ⅛″ flat rubber to each propeller.

To fly, set the main plane about 4″ from the rear propeller spar and the elevator about 8″ back of the apex of the frame, insert a small block of wood under the leading edge of the elevator to give it the required angle of incidence. Twist the propellers reverse way a few times to take the slack out of the rubber.

Hold the propellers and propeller spar with the right hand, place the left hand at a point under the elevator to balance.

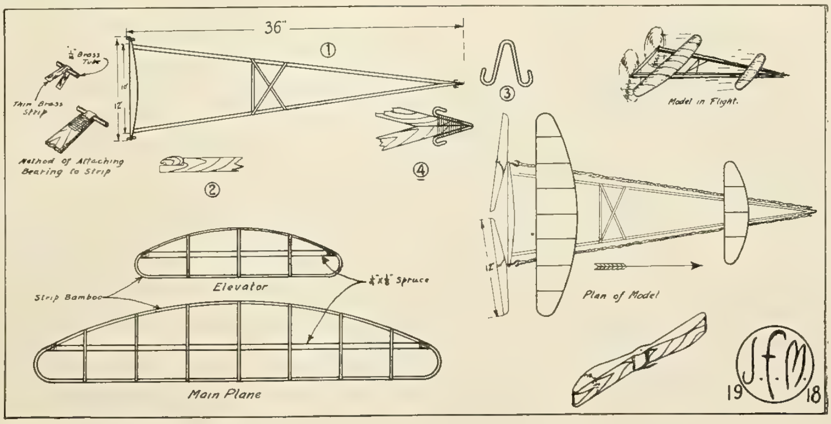
Now hold the model on a line with the shoulders and throw gently, as in launching the Tractor. (The push should be given with the right hand, the left is used to balance the model.)

After a few experimental flights shifting the wings back and forth, or placing a thicker or thinner block of wood under the elevator, the model flyers will discover the proper combination to get the maximum flight out of the model.

To wind the motors up it is necessary to have the assistance of another person to hold the model, because it is necessary to stretch the rubber at least twice the length of the machine to get the maximum revolutions out of the rubbers. A small hand drill is used by some model flyers for winding the rubber, while others use an egg beater cut down.

The egg beater is the better winder because it winds both rubbers at once on opposite directions and an even amount of revolutions. If the drill is used it is necessary to wind one rubber one way, counting at the same time, then wind the other the reverse way, counting again, so as not to have one wound tighter than the other.

(To be continued)



Aeronitis

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

This Actually Happened

A Joy-killer is a bird you take for a beginner. He goes up with you, and you give him an Immelman, coming out flat on your back. After that, some engine side-slips to vary the monotony. Then, when you come down, you look closely to see if the sport hasn't made him a little white around the gills. Far from it! He fishes out a cigar and calmly announces: "It has been a long time since I did any of that old stuff. I like to go up and ride upside down for twenty or thirty minutes, and wind up with a reverse loop!"

And We've Said it All Along

We know a way to stop this darn war in exactly one day. Here it is—give Bill Hohenzollern a thousand bombers and bombing pilots to talk to him and the Kronprinz for that length of time.

Where Ignorance Is Bliss

Realizing the grave danger in flying, a cadet's sweetheart wrote him last week to "be careful for her sake and in the future to fly low and slow," thereby making the training less hazardous.—Plane News.

Every Move a Picture

Monitor: "Your 'take off' was very wobbly."

Cadet: "Yes, I was 'taking off' Charlie Chaplin."—Plane News.

Ye Editor-Aviator

Contrib. (scratching his head): "Anybody know anything good for 'Tale Spins'?"

Lieutenant Baker (automatically): "Yeah. Put your controls in neutral."

Goin' Up

Negro (to recruiting officer): "Boss, whar do de Infan'ry all fight?"

Recruiting officer: "The Infantry fights in the trenches."

Negro: "And whar do de artillery fight?"

Recruiting officer: "The artillery fights from behind the trenches."

Negro: "Well, then, boss, whar do de aviashon fight?"

R. officer: "The aviation fights in the air."

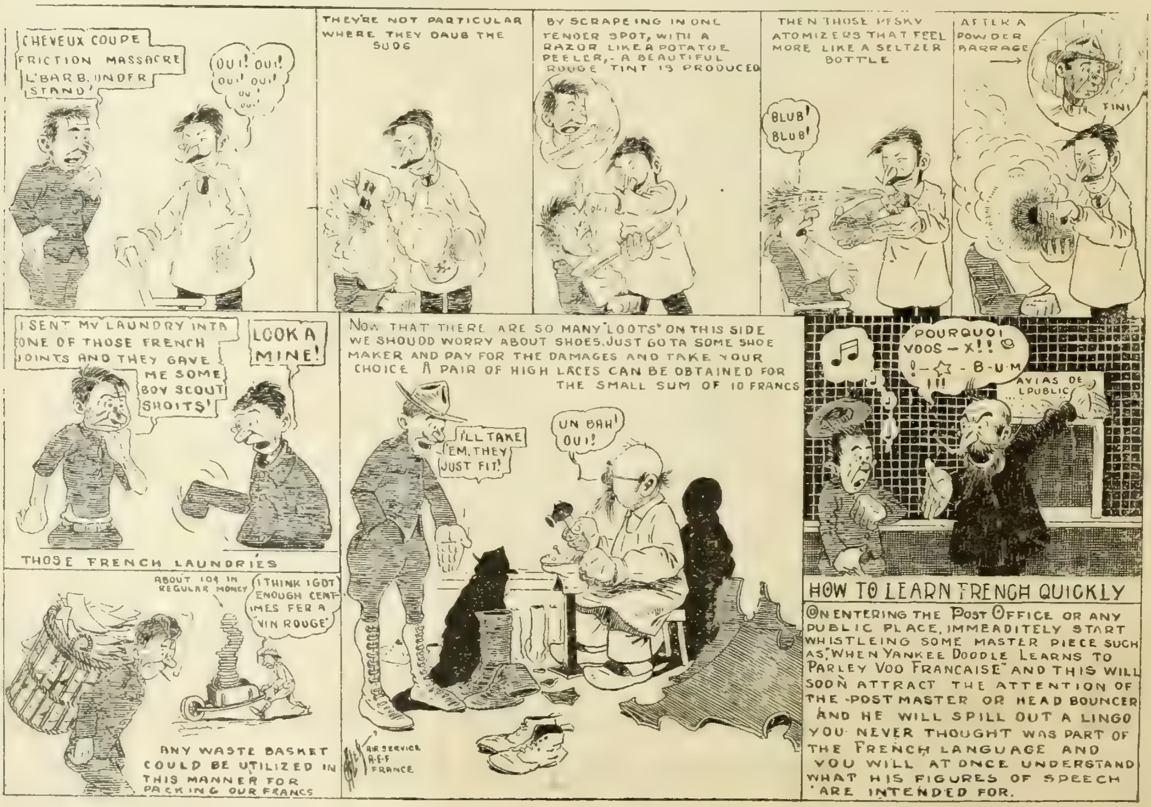
Negro: "Well, den, boss, dat's what I done want to jine."

R. officer: "And why do you prefer the aviation?"

Negro: "Well, sah, I already done told my wife that ah wus gwine to be de man highah up."

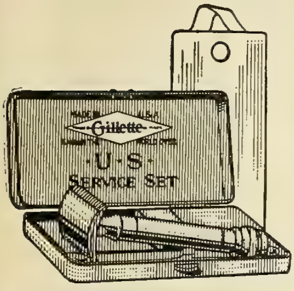
OUI! THIS IS FRANCE

By "Alex"

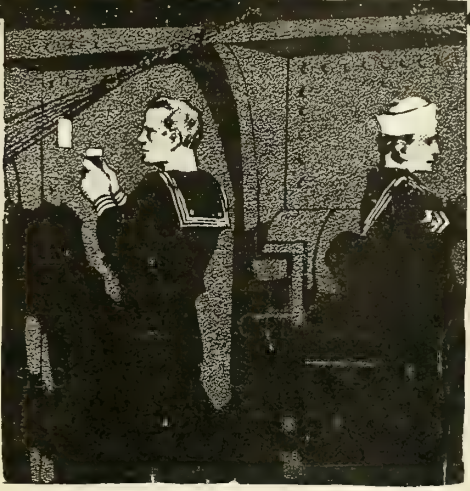

CHEVEUX COUPE FRICTION MASSACRE L'BARB. UNDER STAND'
OUI! OUI! OUI! OUI! OU! OUI!
THEY'RE NOT PARTICULAR WHERE THEY DAUB THE SUDS
BY SCRAPEING IN ONE TENDER SPOT, WITH A RAZOR LIKE A POTATOE PEELER,- A BEAUTIFUL ROUGE TINT IS PRODUCED
THEN THOSE PESKY ATOMIZERS THAT FEEL MORE LIKE A SELTZER BOTTLE
BLUB! BLUB!
FIZZ
AFTER A POWDER BARRAGE →
FINI
I SENT MY LAUNDRY INTA ONE OF THOSE FRENCH JOINTS AND THEY GAVE ME SOME BOY SCOUT SHOITS!
LOOK A MINE!
THOSE FRENCH LAUNDRIES
NOW THAT THERE ARE SO MANY "LOOTS" ON THIS SIDE WE SHOUDD WORRY ABOUT SHOES. JUST GOTA SOME SHOE MAKER AND PAY FOR THE DAMAGES AND TAKE YOUR CHOICE A PAIR OF HIGH LACES CAN BE OBTAINED FOR THE SMALL SUM OF 10 FRANCS
I'LL TAKE 'EM. THEY JUST FIT!
UN BAH! OUI!
ABOUT 10¢ IN REGULAR MONEY
I THINK I GOT ENOUGH CENTIMES FER A "VIN ROUGE"
ANY WASTE BASKET COULD BE UTILIZED IN THIS MANNER FOR PACKING OUR FRANCS
ALEX AIR SERVICE A.E.F FRANCE
POURQUOI VOOS — X!! ! — ☆ - B-U-M !!!
AVIAS DE LPUBLIC
HOW TO LEARN FRENCH QUICKLY
ON ENTERING THE POST OFFICE OR ANY PUBLIC PLACE, IMMEADITELY START WHISTLEING SOME MASTER PIECE SUCH AS "WHEN YANKEE DOODLE LEARNS TO PARLEY VOO FRANCAISE" AND THIS WILL SOON ATTRACT THE ATTENTION OF THE POST MASTER OR HEAD BOUNCER AND HE WILL SPILL OUT A LINGO YOU NEVER THOUGHT WAS PART OF THE FRENCH LANGUAGE AND YOU WILL AT ONCE UNDERSTAND WHAT HIS FIGURES OF SPEECH ARE INTENDED FOR.

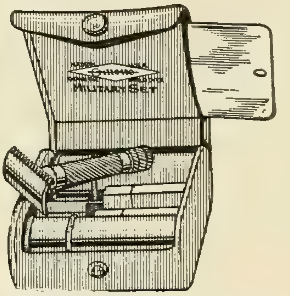
Courtesy "Plane News"

Gillette SAFETY RAZOR



The New U. S. Service Set.—A solid metal case, heavy nickel-plated and embossed with the insignia of the U. S. Army and Navy. Strong, thin, compact; 1⅞ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box, indestructible Trench Mirror inside the lid . . . $5





Military Set No. 18—For Uncle Sam's Officers. a Gillette Combination Set, in case of U. S. Regulation Khaki twill—nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges) $7

Even when there isn't much time or room for a shave, the Gillette makes shaving a comfort

The thousands of Gillette users in the Service, everywhere—on land or sea—would use the Gillette even if the Regulations didn't specify a clean shave. Braces them up, and gives such a clean feeling. It gets any man on his tip-toes to feel his beard slip off under the Gillette—his face free of dust and grime, cool and fresh. The Gillette makes shaving a joy—not a job.

Have you seen the new Gillette sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette Organization in the Service—men who know what the fighting man is up against

Simple and compact, fit the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready.

No Stropping—No Honing When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen or Y. M. C. A. Hut, here in America or overseas.

Our Paris office carries stocks—is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy and the Eastern battle fronts.

Here's the Way to Get 100% Efficiency Out of Your Gillette

Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in—that's essential with any shave.

Put in a new blade and screw the handle down *tight*. If you want a specially close shave, *unscrew* the handle a *part turn*.

Hold the razor *naturally* and *easily*, and tilt the handle so you can just feel the blade engage the beard.

Then shave with short slanting strokes. It doesn't require any brute force to shave with a Gillette—the razor does the work.

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73 St. Alexander St.
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Anonyme
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Gillette Safety Razor, Ltd.
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London, W., England

A. G. Micheles
53 Liteiny, Petrograd, Russia

Vedova Tosi Quirino & Figli
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Milan, Italy

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Boston Mass·U·S·A·

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WOOD RIBS, STRUTS AND PARTS
SEAPLANE DEVICES FOR LANDING ON COMMERCE SHIPS
JANNEY-STEINMETZ CO., PHILADELPHIA

(*Continued from page* 781)

connection with the lateral dihedral principle. Apart from these preceding considerations of height of the centre of gravity, there is another important factor apt to be disregarded. *If the masses of an aeroplane are so distributed that the machine has a virtual axis of inertia inclined downard and forward, the lateral dihedral principle becomes unstable and the negative dihedral or Vee opening earthward becomes stable.* This theory has only been previously put forward on one occasion, and then it was so formulated as to appeal to designers to adopt this crude weight distribution in conjunction with the negative lateral dihedral. But as an aviator the writer prefers to see the positive dihedral correctly applied and to warn the designer against the weight distribution, which will render the dihedral unstable if he adopts it. More accidents are likely to be prevented by taking this course than by advocating the other rare principle.

The explanation, of course, is very simple. Consider a marine aeroplane (Britishers are finding that marine aeroplane is better than a multiplicity of alternatives, such as seaplane, waterplane, etc.) in which there is a heavy seaworthy boat low and in front, planes staggered back with probably a fuselage in between, and lastly a heavy engine on top of the rear top plane. This machine has its inert masses on a line running downward and forward from the centre of gravity of the engine. Give this aeroplane a lateral dihedral angle. If the pressure on the near wing is augmented by a gust or change in the relative wind rotation occurs about this *inclined* axis. Thus the near wing, instead of going out of the gust, comes more and more into prominence. The system is unstable. As an aviator, of course, the writer is not too well acquainted with the methods of designers of high class aeroplanes, but he hopes they will find the points raised worthy of their consideration.

(*Continued from page* 778)

out of their brains will come, I believe, hundreds of improvements that will make the aeroplanes of tomorrow equally radical in their epoch-making possibilities.

We will win this war; why? Because it is a war of democracy against autocracy, a war of mental freedom against mental domination, a war of right against wrong.

Right will conquer, it always has and it always will. Humanly speaking, this war is a mechanical war, a war to be waged and won with machines directed from the air. It is a war that our *red*-blooded young men, in whose hearts have been kindled the *white* heat of true patriotism, flying in the *blue* sky of an ever-increasing democratic world, will, with the help of almighty God, fight to a glorious and victorious end.

After Altitude Record

Hampered by unsatisfactory weather conditions, Lieut. Culver, of the aerial mail service, arrived at Belmont Park soon before three o'clock on June 10, after a slow flight from Philadelphia. He brought with him five pouches containing 130 pounds of mail.

Lieut. Culver reported that on his trip to Philadelphia on Saturday, he had tried for an altitude record, hoping to reach 20,000 feet in the fine weather he at that time encountered. He reached a height of nearly 18,000 feet but found it so cold that he decided to put off the test until his next Philadelphia bound trip, when he will make special preparation to withstand the altitude temperatures.

Becomes Bride of Aviator

In St. Agnes' Church, at Hoyt and Sackett streets, Brooklyn, last Wednesday, Miss Marie Agnes McCormack, daughter of Mrs. Elizabeth McCormack, of No. 340 Union street, Brooklyn, became the bride of Lieut. Vincent J. Coletti, at present attached to the Aviation Corps at Park Field, Memphis, Tenn. The Rev. James D. Duffy officiated.

Aeroplane Carries Cargo

French aviators in a seaplane carrying 660 pounds of cargo flew from Paris to London in two hours and three-quarters and back again in less time. With the development of aviation on the practical side, there may be no need of that long-mooted tunnel between England and the Continent.

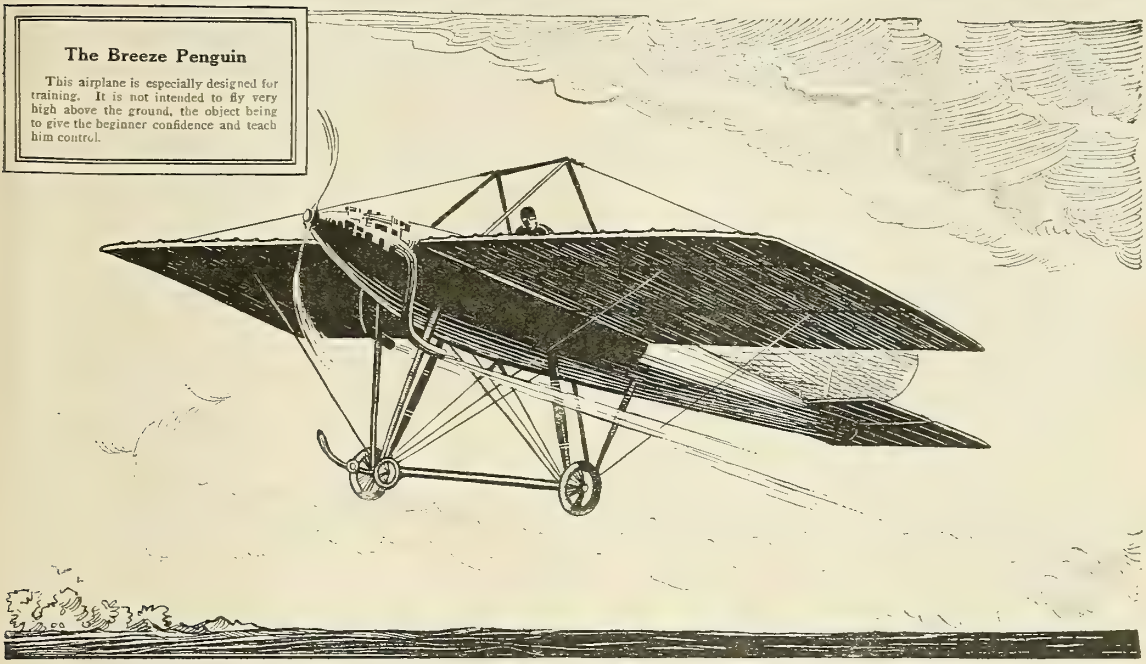
To Speed Up Aero Mail

Paris, June 9.—A midnight air-raid party in a Paris hotel cellar was entertained by reading home news in *The New York Times* twelve days ago, which one of the group had just received in the American mail. Special interest was shown in the cellar in the news about the aero mail service between Washington and New York. The listeners wanted to know why time was lost by the mail planes landing on Long Island.

"Why," asked a woman in a bathrobe, sitting on a barrel, "can't they build a big platform on the roof of the New York City Post Office, and let the planes fly low enough to drop pouches on a platform?"

Superintendent of Mails E. M. Norris said in regard to the above dispatch that it was entirely feasible for aeroplane mail to be dropped on the roof of the New York Post Office, provided the high buildings of the city would permit the aeroplanes to fly sufficiently low, but that mail could not be picked up by machines starting to Washington.

"Some time ago," he said, "representatives from two aeroplane factories measured the roof of the Post Office and said it was practicable for aeroplanes to start and alight there. They wanted a fifty-thousand-dollar apparatus built. If aeroplanes could start directly from the Post Office and alight there, about an hour could be saved in each direction between New York and Washington."



The Breeze Penguin

This airplane is especially designed for training. It is not intended to fly very high above the ground, the object being to give the beginner confidence and teach him control.

Valspar withstands the strains of Training Service—

TRAINING-PLANES are bound to get much hard usage at the hands of inexperienced operators.

Valspar successfully resists all this rough treatment. Just as it has been found best for planes in active service at the front, it is also found to be the most reliable for training service at home.

Valspar is not only water-proof but proof against all kinds of weather as well.

The use of Valspar by the Allies on all the war-fronts attests its supremacy as the world's greatest airplane and seaplane varnish.

Our Airplane Service Department is at your service. To purchasing agents and superintendents of production we will on receipt of name gladly send a valuable handbook on this subject.

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willing workers made it possible for this powerful aeroplane to take to the skies to help win the war in the Air for the Allies.

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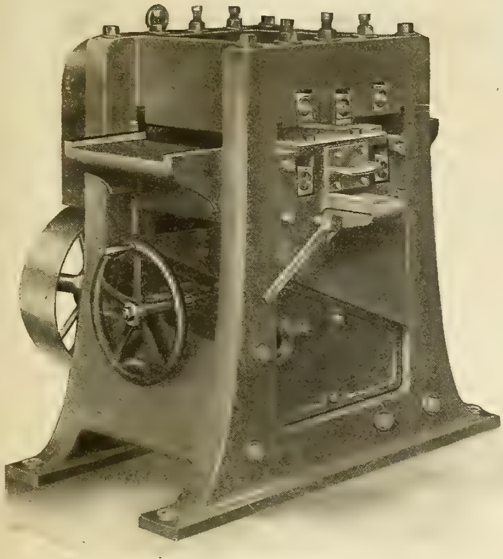
Aerial Age Weekly

280 MADISON AVENUE
NEW YORK CITY

Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a



Whitney Scraping and Toothing Machine

WHITNEY
Toothing Machine

If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

Write for catalog
and samples of toothing

Baxter D. Whitney & Son
WINCHENDON **MASSACHUSETTS**

(*Continued from page 785*)

Rabenstein, Maurel K.	FRF
Reichardt, Chris	FRF
Rose, Joseph E.	FRF
Reed, Carroll C.	FRF
Reeve, Jay F.	FRF
Rechsteiner, Victor Martin	SLR; RSD
Robinson, Edward Heaword	FLR; DAP
Ransom, Harold Browne	SLR; KST
Reeve, Jay Frederick	SLR; RWT
Rue, Lars	DIK
Regan, Harold J.	DIK
Reilly, Francis Thornton	SLR; Note 5

S

Smith, Ernest L.	SLR; AAD
Smith, Harold Arthur	SLR; KST
Smith, Clarence B., Jr.	TFT
Smith, Fred H.	TFT
Schanck, Rollin N.	TFT
Silcott, Arthur E.	TFT
Sloan, Clarence B.	TFT
Sullivan, Henry B.	TFT
Stine, Harold Blaine	SLR; ELA
Sullivan, Charles Wesley	SLR; RSD
Slattery, Thomas A.	MAC
Shober, John B.	WDM
Swaller, Sidney R.	DIK
Spilmah, Louis	SLR; RSD
Schwartz, Charles William	SLR; RSD
Siner, Louis Harry	SLR; RSD
Stites, James Walker	SLR; KST
Small, Sydney F.	DMA
Spencer, Vernon W.	FRF; DIK
Shirley, Walter H.	TMA
Sauls, Jesse W.	PFO
Shillington, Waldo E.	PFO
Snarenberger, [illegible]	SLR; PMT
Spinning, Fred [illegible]	SLR; RWT
Sweeney, Edward [illegible]	SLR; EOT
Shaw, William [illegible]	SLR; ELA
Schlemmer, [illegible] Charles	SLR; KST
Scott, James Hardin	SLR; RSD
Shine, Ira James	SLR; KST
Sloniger, Eyir L.	SLR; KST
Stedman, Livingston Boyd, Jr.	SLR; KST
Schuck, Harold Belzer	SLR; CWT
Spencer, William Warren	SLR; MDO
Spivery, Lloyd G.	DIK
Stetson, Phillip C.	DIK
Sherman, John K.	FRF
Sharon, William F.	TFT
Stratton, Frank A.	HHN
Stout, Sydney Allerdice	SLR; RSD
Stockman, Otto J.	LHV
Stone, Percy N.	SLR; FRF; PMT
Scott, Townsend, Jr.	FRF
Sampter, Herbert C.	CWT
Shepherd, Floyd W.	CWT
Shay, Carleton C.	DIK
Stanley, John M.	TFT
Sweeley, Lester J.	TFT
Stout, Samuel C.	DIK
Suthers, William J.	DIK
Senft, Walter M.	DIK
Symonds, Merrill E.	SLR; EOT
Shannon, Arthur James	SLR; LDT
Sullivan, William Simmons	SLR; AAD
Stewart, Robert H., Jr.	FRF
Slocum, Paul F.	DMA
Squier, Carl B.	SMM
Slade, William	SMM
Snyder, Robert Y.	CFT
Steinhauer, Louis Edward	SLR; EOT
Stezler, Harry G.	FRF; DIK
Sherwood, Lyman Wetmore	SLR; KST
Symons, Thomas William, Jr.	SLR; RSD
Simpson, George Logan, Jr.	SLR; CWT
Swift, Charles Patrick	SLR; TFT
Schmidt, Edgar August	SLR; CWT
Stephens, Russell Stout	SLR; LDT
Savage, Clair R.	FRF
Sullivan, Edward B.	FRF
Stukey, David C.	FRF
Sullivan, Joseph I.	CAF
Slater, Harry E.	SMM
Stevenson, Frederick D.	LDT
Swallow, Sidney R.	FRF
Scheetz, Jack F.	FRF
Senft, Walter M.	FRF
Swift, Charles P.	FRF
Saunders, Minott F.	SMM
Scott, Neal J.	DIK
Steele, Albert S. J.	SMM
Schram, Herman	DIK
Stalker, Willard C.	DIK
Schlatter, Donald W.	SMM
Smith, George Milan	SLR; RSD
Smith, Vincent K.	LHV
Smith, Carl M.	FRF
Smith, Landis S.	SMM
Smith, Glenn E.	SMM
Safford, Loyal Robinson	SLR
Spafford, Louis Harold	SLR
Stalker, Williard Clem	SLR
Spang, Joseph Peter, Jr.	SLR; FOB
Shearer, David Robert	FLR; DAP
Stanley, Lyman Roberts	FLR; DAP
Spencer, Bonifield Melville	SLR; RSD
Smith, Wesley Leland	SLR; RSD
Smith, Glanton	SLR; Note 5
Stansell, Arthur Dickey	SLR; DAP
Snyder, Gerald Seemuth	SLR; KST
Spellman, Sterling Bartholomew	SLR; RSD
Stone, George Eathl	SLR; SRC
Simmons, Joseph Irving	SLR; Note 9
Spear, Holden	DAP
Stephenson, Arthur Warren	SLR; RSD
Spencer, Henry Wesley	SLR; EOT

T

Twining, Albert Chester	SLR; PMT
Taylor, Frederic Halsey	SLR; KST
Thomas, William Albert	SLR; CRI
Thomas, Newell E.	SAG
Tupper, William Stewart	SLR; VBW
Turner, Lambert	SLR; CWT
Tynes, William Fisher	SLR; EOT
Tansley, Thomas L.	TFT
Taylor, Harold L.	TFT
Thiel, William A.	TFT
Tierny, John W.	TFT
Tinnerholm, Robert F.	TFT
Tobey, Paul T.	CWT
Tupper, Preston E.	CWT
Tyres, John W.	DIK
Teeter, Charles	DIK; FRF
Tolles, Raymond P.	PFO
Tillinghast, Harold A.	AAD
Taylor, Leonard D.	FRF; SLR; AAD
Tussing, Earl R.	DIK
Tyler, Lee	DIK
Trowbridge, James Orr	SLR; EOT
Tillisch, William Henry	SLR; KST
Tomlinson, Kenneth C.	SLR; RSD
Tucker, Ernest A.	SLR; FRF
Torney, Stewart W.	TFT
Tompkins, John L.	TFT
Thompson, Howard C.	SLR; VBW
Thigpen, Roy Miller	SLR; KST
Tower, Roderick	HHN
Tyler, Bernard Otto	SLR; EOT
Thomas, Charles E.	FRF
Taylor, George deB.	FRF
Thayer, Alexander D.	SMM
Thomson, Henry	SLR; RSD
Tanner, Herbert J.	FRF
Trueheart, James O.	DIK
Tefft, Lionel V.	FRF
Turner, Robert W.	SMM
Turrill, Gardner Stilson	SLR
Tynes, William F.	TFT
Templeton, Raymond E.	SMM
Terrell, Lasater	SMM
Thomson, Robert Richardson	SLR; DAP
Thayer, Raymond Harold	SLR; KST
Thompson, John Faville	SLR; RSD
Thomas, William G.	FRF
Tracy, Ray Perry	SLR; KST

(*Continued on page 796*)

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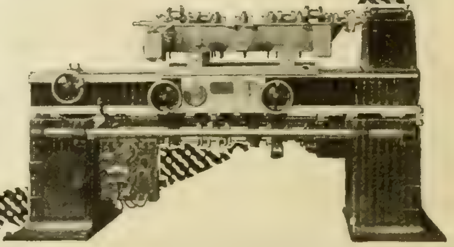

(Continued from page 793)

V

Verkrouteren, John Henry	SLR; EOT
Vance, Earl T.	FRF
Vaden, Ferris E.	DIK
Vessey, Burton Floyd	SLR; KST
Vinton, Benjamin	CWT
Veblen, Elling H.	FRF
Van Horn, John Willis	SLR; KST
Vandermeer, Dirk J.	SLR; TFT
Van Capen, William	FRF
Voorhees, Garret Samuel	SLR; EOT
Vosburg, Burray S.	MAT
Vaden, Ferris Edgar	SLR; RWT
Van Kirk, Russell Morris	SLR; CWT
Van Valin, Oliver Jay	FRF
Vernon, Fred	SMM
Vickery, Merritt A.	FRF
Van Buren, Henry M.	PFO
Von Bokern, Frank	RTR

W

Willson, Ray Duff	DIK
Wheeler, Oliver Percival	SLR; RSD
Wilbur, Fred V.	SLR; FRF; PMT
Whiteside, Robert B	FRF
Weymouth, Frank William	SLR; RWT
Walrath, Duane Everett	SLR; KST
Williams, William P.	SLR; MAC
Whitbeck, Robert R.	MAC
Waldrom, Ralph E.	PFO
Watson, Vernon A.	PFO
Wiegman, John P.	PFO
White, Lloyd K.	SLR; FRF; LDT
Wright, Putney L.	TFT
Wright, Stanley V.	TFT
Wardell, Charles H., Jr.	CWT
Whitten, Lacey R.	CWT
Woods, Roy J.	DIK
Woolman, Cony C.	MAC
Wilkinson, James L.	DIK
Wilbur, Fred V.	DIK
Welch, Peter W.	DIK
Welsh, Horace Oliver	SLR; CJW
Wylie, John	SLR; RSD
Winch, George Arthur	SLR; RWT
Webb, Sigel Goodwin	SLR; RSD
Wieslander, Leslie Rudolph	SLR; RSD
Whitsitt, Vincent P.	EOT
Welsh, William W.	SLR; FRF; AAD
Williams, Luther Bozeman	SLR; KST
Wilkinson, James L.	SLR; FRF; PMT
Warde, Arthur F.	DIK
White, Harwood Arend	SLR; TFT
Wallace, Vester M.	BST
Williamson, Cleburne M.	SLR; DIK
Wheeler, Franklin C.	FRF
White, Harwood A.	FRF
Whitten, Lyman P.	FRF
Westbrook, Virgil Darst	FRF
White, Harold A.	FRF
Wilkins, Alfred E.	FRF
Willett, Albert B.	FRF
Winch, George A.	FRF
Wright, Joseph H.	FRF
Wilkinson, William T.	FRF
Whitney, Cornelius V.	FRF
Welsh, Horace O.	FRF
Wilkes, Preston Brooks	SLR; CSO
Worrell, Willard Parker	SLR
West, Norman Stewart	SLR
Wiley, Edmond Fenton	SLR
Wardwell, Chester Theodore	SLR; CJW; FRF
Wing, Charles Rufus	SLR; RWT
Willard, Alfred J.	DIS
White, Kenneth T.	FRF
Woodies, Arthur F.	FRF
Wood, Joseph, Jr.	DMA
Wood, Edward H.	SMM
Warfield, Richard E.	MAC
Watson, Edward B., Jr.	FRF
Walker, Howe	FRF
Wallace, Edward S.	FRF
Warren, Kenneth C.	FRF
Watson, Charles F.	FRF
Whittemore, Harris, Jr.	FRF
Woodleton, Royal B.	SMM
Wright, Arthur W.	CFT
Westall, William H.	DIK
Wright, Joseph Hazazer	SLR; RWT
Walker, Walter Treat	DAP
Wolf, John Elmer	SLR; RSD
Wootten, Richard Kelly	FLR
Williams, Paul Klostar	SLR; KST
Woolsey, William W.	DAP
Wilkeson, Livingston Evans	SLR; RSD
Witbeck, Robert Raymond	SLR; RSD
Walker, Ralph Glade	SLR; RWT
Wright, William Milton	SLR; RSD
West, Harry G.	DAP
Wells, Harold Raymond	DAP

Y

Young, George Edward	SLR; RSD
Young, Wallace S.	SMM
Yager, Frank R.	FRF
Yocum, Reuben John	SLR; KST

Z

Zimmerman, Earl Henry	SLR; RSD
Ziegler, John W.	FRF
Zeisenheim, Joseph R.	FRF

(Continued from page 760)

In October, 1916, a site was selected for the committee's proposed laboratories, 4 miles north of Hampton, Va., and the selection was approved by the War Department, which purchased the site. A contract has been entered into for the erection of the first building, at an estimated cost of $80,900. The building is now in course of erection. The committee has also under preparation plans for the first aerodynamic laboratory, to be installed at Langley Field, intended for the development of high wind speeds.

Early in 1917 the committee took up the question of insurance for aviators, and recommended the advisability of undertaking at an early date the insurance of aviators, or some form of financial co-operation with the insurance companies that would enable them to write insurance at rates possible to the insured.

Investigate Use of Steel for Planes

The committee has now in hand (November, 1917) a most important investigation on the use of steel for aeroplane construction, and is supervising the development of a design for construction of steel, to be later subjected to a program of tests, intended to show the possibilities of this construction. In connection with material tests, the committee has given attention chiefly to an investigation of strut forms for aeroplanes, the strength of spruce bars, and the development of cotton aeroplane fabrics as a substitute for Irish linen. In the field of power plant design, the committee co-operated with the Bureau of Standards in the design, construction, equipment and operation of a large low-pressure chamber in the testing laboratories, which is intended to reproduce the conditions of aircraft engines operating at high altitudes. This work was especially done in connection with the development of the Liberty engine. Researches were also carried out on the oubjects of radiator design, carbureter design and adjustment, ignition aparatus, etc. One of the members of the committee's technical staff supervised the tests on the first Liberty engine at Detroit, Pike's Peak and elsewhere, to determine the mechanical and thermal efficiencies and its power delivery at various altitudes.

Important investigations have been made in connection with various instruments used on aircraft, and in particular there has been developed an improved form of geographic position indicator. The committee has co-operated in the development of a generator for wireless transmission from aeroplanes, intended to satisfy the

(Continued on page 798)

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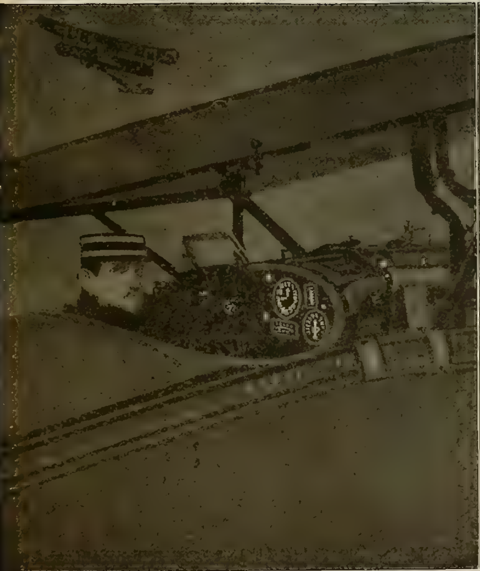

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(*Continued from page 796*)

requirements of the Army and Navy. Methods of receiving wireless signals in an aeroplane have also been investigated, and it has been established at several receiving stations that the sound method is practical.

Under the auspices of the committee, gratifying progress has been made in the development of a new type of aeroplane mapping camera. Before regular navigation of the air can be undertaken, it will be necessary to supply maps and to establish suitable and marked aerial routes and suitable landing places for the aviator. In certain sections of the country, and through the general co-operation of patriotic citizens interested in this work, gratifying progress has been made in these directions, notably between Dayton, Ohio, and Rantoul, Ill.

At the recommendation of the committee, an appropriation of $100,000 was made by Congress for the extension of aerological work of the U. S. Weather Bureau.

The committee has also acted as a board of inventions for the Government, in matters relating to aeronautics, and since the outbreak of hostilities has weekly examined hundreds of suggestions and inventions. Several suggestions of value have been received and brought promptly to the attention of the particular Government office most directly interested. Further attention has been given during the year to the subject of the definition and examination of technical terms used in aeronautics, and a further edition of the bulletin on the subject of nomenclature has been prepared.

On recommendation of the Advisory Committee, in December, 1916, the War, Treasury, Interior and Commerce departments adopted the metric system of weights and measures for all drawings and calculations on aeronautical matters, for use with their accompanying English equivalents. However, owing to war exigencies, the system has not been generally used by the War Department. Some work has been done in connection with the problems of aerial mail service and civil aerial transport.

For the accommodation of transient aviators in Washington, the committee co-operated with the War Department in the selection of a tract of land on the eastern branch of the Potomac River, southeast of the Washington Navy Yard.

In November, 1917, members of the Advisory Committee, in two different groups, made trips of inspection to three important centers of aeroplane production, namely, Dayton, Ohio; Detroit, Mich., and Buffalo, N. Y. The object of these trips was to place the committee in immediate contact with conditions in the industrial field and to give them an opportunity of forming a personal, first-hand judgment regarding the productive capacity for aeroplanes and aeronautic engines at that date. The members were very favorably impressed with the serious energy and purpose with which the manufacturers were approaching the problem of quantity production, and with the productive capacity now rapidly approaching the point of effective service.

Eleven technical papers are included with the report, as follows, Meteorology and Aeronautics, by Prof. William R. Blair; Experimental Research on Air Propellers, by Dr. William S. Durand; Nomenclature for Aeronautics, by Dr. Joseph S. Ames; Stretching of the Fabric and Deformation of the Full Balloon, a translation from the German, by Prof. Karl Darrow; An Investigation of the Elements Which Contribute to Statical and Dynamical Stability and of the Effect of Variations in Those Elements, by Prof. Alex. Klemin; Aerofoils and Aerofoil Structural Combinations, By Major H. S. Martin, S. C., and Major E. S. Gorrel, S. C.; Periodic Stresses in Gyroscopic Bodies with Application to Air Screws, by Dr. A. F. Zahm; Aerodynamic Coefficients and Transformation Tables, by Dr. Joseph S. Ames; Theory of an Aeroplane and Housing Gusts, II, by Prof. E. B. Wilson; Fabrics for Aeronautic Construction, by E. D. Whalen; Aeronautic Power Plant Investigation, by Dr. H. C. Dickinson.

Future Travel and Mails by Air

The future of aeronautics in commerce was discussed by Mr. G. Holt Thomas, managing director of the Aircraft Co., Ltd., in an address at the Savoy Hotel to the American Luncheon Club. The recent advance on the part of the Germans, he said, could not have taken place if we had had enough aeroplanes. The Germans had started a service between Berlin and Constantinople. It was said that the aeroplane was not a commercial proposition because it could not carry a motor car. It could carry weights greater than a motor car. The claims for commercial, or uncommercial, aeronautics were: (1) It was faster than any other form of transport; (2) it was quite reliable enough to-day, and would get much more reliable as engines improved; and (3) it was not too costly to make it a commercial proposition. From London to Berlin the fastest route was 20½ hours; by aeroplane it was 7½ hours. To Constantinople the fastest route was 72 hours, but with an aeroplane travelling only 80 miles an hour they could get there in 20 hours. Petrograd was 50 hours away by the fastest route, and an aeroplane would take only 18 hours. There was no place on earth farther than five days from London at 80 miles an hour. He did not suggest that one machine would fly from London to Melbourne, but routes could be established. We had to look upon a commercial system of aeroplanes as a series of stages, with changing machines and pilots. Melbourne was five days from London at 80 miles an hour, Tokio, 4½ days; New York two days by the longest route, via the Azores, Buenos Aires, 2½ days; Ceylon, 2¾ days; and Cape Town, three days. Taking the cost of running an aeroplane with two engines and carrying a good load at 5s. per mile between London and Paris, the cost of the carrying of mails worked out at one-third of a penny per ounce. and if they charged a halfpenny an ounce they would make a good profit. They could carry passengers to Paris at £5 a head, to Marseilles at £10 per head, and to Constantinople at £25. He was talking about full loads all the time. The post to Paris would, of course, be a special service at a special rate.

Lieutenant Baer, Ace, is Prisoner

Fort Wayne, Ind.—Lieutenant Paul Frank Baer, the American "ace," who has been reported missing since May 22, is a prisoner in a German camp, according to confirmatory telegrams received.

U. S. Flier Captured

Paris.—Lieut. R. W. Parker, an American pilot in the French Flying Corps, was forced to land while acting as a scout on a bombing expedition over Germany.

He was taken prisoner by the Germans.

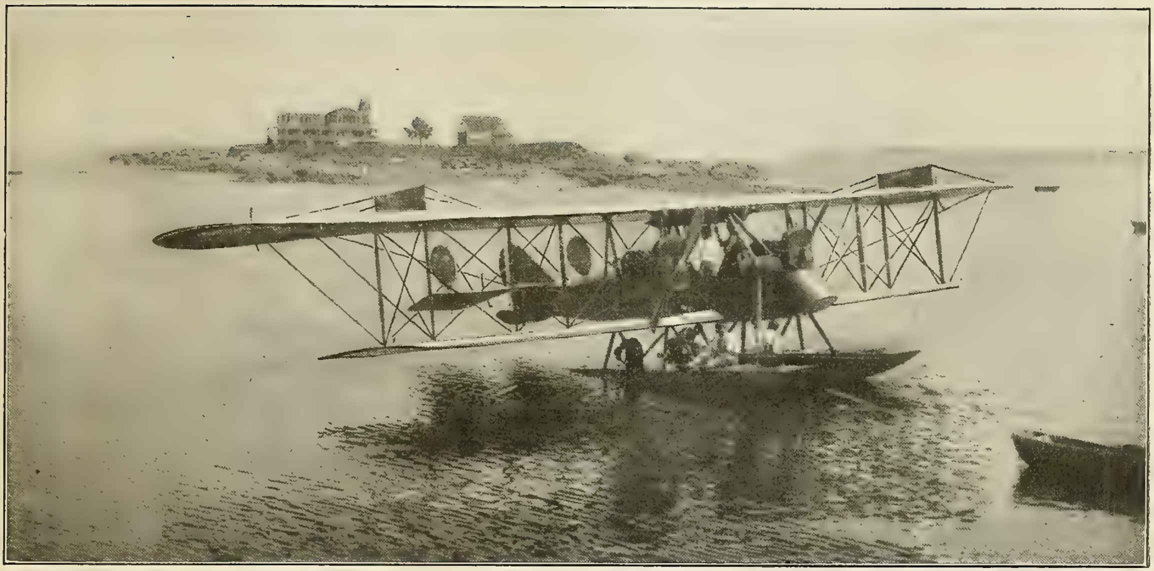
More Planes Wanted

An Atlantic Port.—"Send us 20,000 aeroplanes and aviators enough and we will win the war. We have plenty of men, and the French can hold the enemy in France if America will only provide the aeroplanes."

Such was the plea of J. V. Davy, of the French Ministry of Agriculture, who arrived at this port on a big French trans-Atlantic liner.

Frederick H. Prince, a brother of Norman Prince, who was killed in France, also spoke of the need of more force in the air for the Allies on the Western front.

"Everything is fine over in France now," he said, "but they need aeroplanes and aviators, plenty of them. They are an absolute necessity, and they must get over there quickly."



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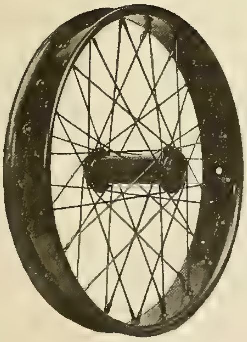

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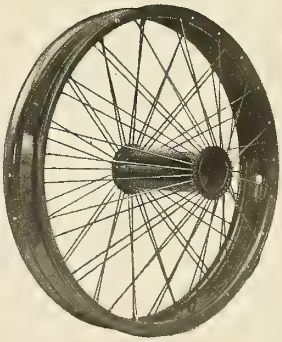

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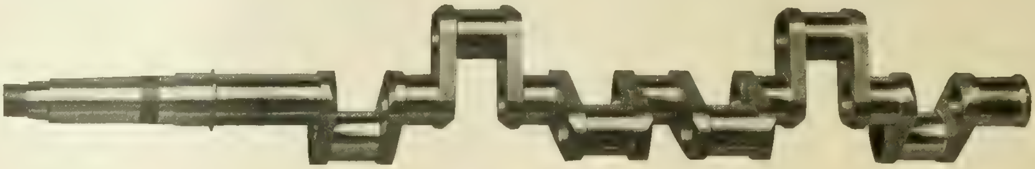

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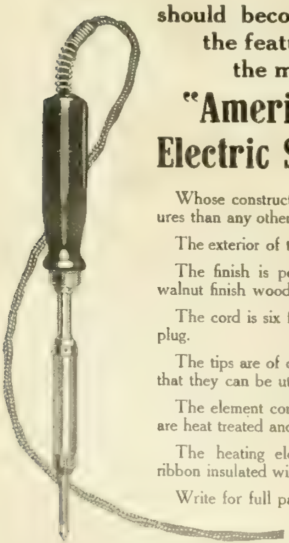

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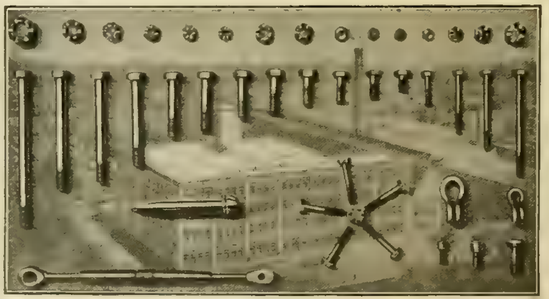

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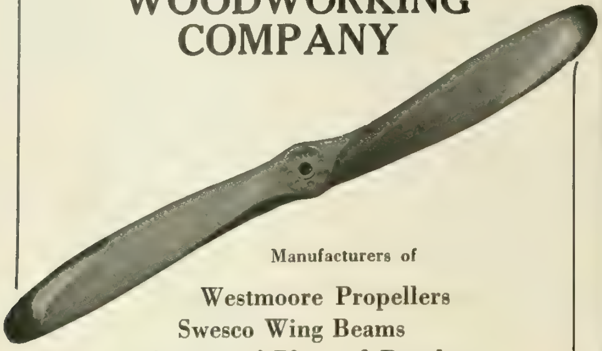

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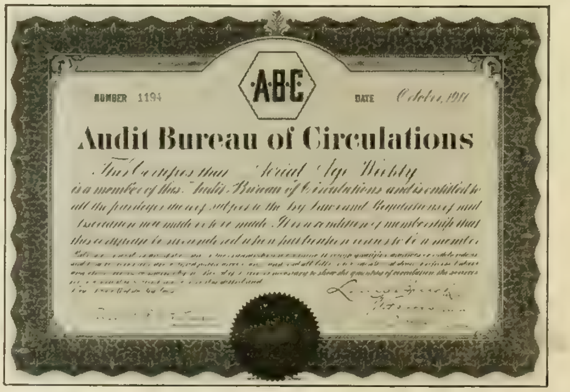

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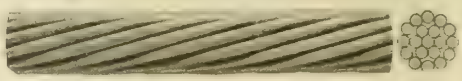

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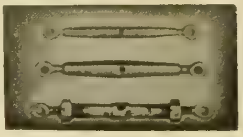

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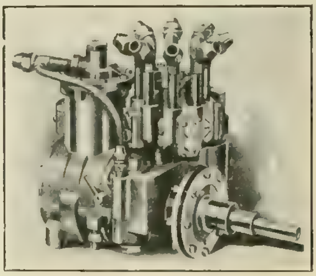

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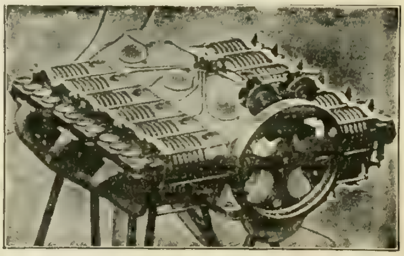

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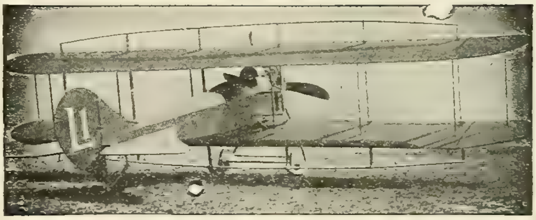

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OFFER 10,000 PLANES TO FLY TO FRANCE

W. H. WORKMAN, the American manager for the Handley Page Company, has announced that he had laid before the War Department, the Aircraft Board, and the Department of Military Aeronautics a plan to build 10,000 bombing machines in this country and fly them over to France by the Spring of next year. Mr. Workman, who accepted the proposal of the Aero Club of America to make a single flight, said that the plan to fly big American planes to Europe was not only feasible, but was a practical and sure way to deliver the machines without requiring so much shipping as to cripple the transport of troops and other supplies.

The wear-and-tear on the machines by the flight, said Mr. Workman, and the possible loss of machines en route, would probably come to a smaller total than the loss of aeroplanes by the sinking of freight ships by submarines, if they were sent in cargo boats. He asserted that the plan could be carried out with little or no loss of life by aviators flying the machines, whereas their delivery and use in France early next year would be sure to save thousands of American soldiers. According to Mr. Workman, 10,000 big American bombing planes in France next year would win the war.

Mr. Workman proposed that the aeroplanes should fly across the Atlantic with a full crew and complete load of bombs and other equipment. His plan would have the first lap of the flight from the aeroplane factory to Newfoundland, the second to the Azores, the third to Portugal, and the fourth to France. While great construction work and organization would be required at Newfoundland and at the Azores, Mr. Workman asserted that this part of the program was no insuperable obstacle.

He was quite certain that the flier, aided by wireless instruments, able to detect the distance of wireless waves from stations on the Azores and elsewhere, which would be practically lighthouses for aerial navigation, would be in no danger of getting lost or losing much time through flying off his course. Mr. Workman chose the Azores route, he explained, not only because it broke the flight into two sections, allowing the aviator to rest, sleep, and tune up his machine, but also because the atmosphere was normally clearer by the southern route than it would be in a direct flight across to Ireland. The Azores has a volcano 7,000 feet high, visible at fifty-six miles from the deck of a ship and at a greater distance from an aeroplane, which would also simplify the trip. The longest single flight would be one of 1,250 miles from St. John's to the Azores. From the Azores to Portugal is 700 miles.

"These 10,000 aeroplanes would be sufficient to drop 38,000 tons of explosives every night on German lines of communication, bridges, ammunition dumps and plants, and fortified places. To grasp what this means, it is equal to 38,000 of the largest shells fired by the biggest guns yet constructed, the 16-inch coast defense guns. But, while the extreme trajectory of such a gun carries a shell weighing about one ton about thirty miles, the Handley Page aerial dreadnought will easily carry from Paris to Berlin several times the destructive power of one such shell, and do it nightly, week in and week out. And at the end of thirty or sixty days, if there were anything left of the Germans, they would cry for peace. While doing all this each machine, with the strong armament which it will carry, will be able to defend itself against all attacks made upon it by enemy aircraft.

"This is a gigantic undertaking, but it means that the country must get behind it and accomplish it. When the Administration at Washington wants to sell five billions of Liberty bonds the nation gets behind it. When the War Department makes up its mind to put a million troops into France by July 1 the nation and the shipping get behind that. It will therefore be necessary for the nation to get behind a program of this kind in the same manner, and then we cannot fail."

After replying to various objections which have been advanced against trans-Atlantic flights, Mr. Workman continued:

"Now supposing that it should not be considered altogether possible to fly the 1,250 miles from Newfoundland to the Azores in perfect safety. England recently sank several obsolete cruisers at Ostend. In the British and American Navies there surely must be at least ten destroyers in a state of obsolescence which could be stretched out across the 1,250 miles between December 1 and May 1, to act as lightships, and the pilots of the aeroplanes would never be out of sight of a destroyer. With this aid, together with their compasses and wireless, I cannot see why a single machine need be lost, unless on account of engine failure. This will not happen to all the four engines with which the aerial dreadnoughts are equipped and the flight could be continued with two or three engines to the Azores or, if not, to the nearest destroyer and the pilots and men be rescued.

Handley Page to Come Here

"It may be contended that this program will call for too great an expenditure. During the last year this country has spent or contracted to spend one billion dollars, and contemplates spending that much more this coming year, on aeroplanes. It is now generally understood that the American aeroplane program adopted by the Production Board last year has proved a costly and unsuccessful experiment. It is useless to cry about our spilled milk, but we must realize why it failed and set about the task of recouping ourselves with vigor, resolution, and understanding. The Production Board consisted largely of men who had met with considerable success in businesses wholly different from the scientific production of aeroplanes, and through lack of personal technical knowledge and misadventures, with the advice they chose to accept, they placed the Government in a position of embarrassment from which it is now seeking the best means of avoiding a repetition."

Mr. Workman advised the War Department that Mr. Handley Page, the designer of the bombing machine which bears his name, was ready to come to this country with a staff of experts to start the production properly if the plan were adopted. By building a well-tried type and separating experiment from production, our aeroplane production, according to Mr. Workman, "can be changed from a matter of biting chagrin to the credit and glory of the country."

"The question of engines arises," he continued. "I believe that if the Liberty motor would make such a trip that it certainly would dispel all doubts and criticisms and prove its real worth. A geared Liberty motor, however, will be necessary. If the Liberty motor cannot do it, then the country should know it and stop making them. If they cannot fly across the Atlantic they will never be able to do the work which is over there to be done in long-distance bombing, and in its stead we should be producing Rolls-Royce, Sampson, Sunbeam, and Bardmore engines, which, despite all statements to the contrary, can be produced in this country in sufficient quantity.

"As to the arguments put forth about the wear and tear on the engines, the total wear from Michigan to France would not exceed forty hours. Any aeroplane motor must run almost this long before it is what is termed 'run in,' but suppose it did wear them to this extent. They should be, according to foreign practice and experience, still good for at least another hundred or more hours' service before they would have to be taken down and gone over. Ten thousand bombing aeroplanes each equipped with four motors, on the western front by May 1 of next year, having had forty hours wear, will be better than having 10,000 aeroplanes congested in Eastern ports, but without any wear and being held up for ships to take them to France. Each aeroplane would still be able to do two or three weeks' continual service, and altogether they would drop close on to 1,000,000 tons of explosives on the German Army and all over Germany, which would cut a large hole in the German defense and the German morale, and probably finish the war then and there.

Effect Upon the Germans

"Now let us consider the morale of the Germans. They will naturally think that if we are flying across the Atlantic with thousands of these machines they can expect some real aerial fireworks within a very short time thereafter. The training the pilots will receive in observation work and long-distance flying will be better than all the training they can receive here and will prepare them for the long-distance work they must do from the western front over Germany and return.

"Once this is started there will be a continuous chain of aeroplanes connecting the United States with the continent of Europe from early morning until late at night, one machine leaving every ten minutes every day. The reason for planning for 1919 with a new machine, as stated above, is that our work in this country during the last year has not closed the gap which existed when we entered the war between what was going on in Europe and what was taking place here in aeroplane design, and the advance in the design and the production in England during the last year has been even greater than before. So that we are still further behind in our research and experimental work than we were a year ago.

"It is within the grasp of this country to win the war in 1919 in the air. Much has been said and written during the last year on how the United States would win the war in the air this year. We have lost that chance by our procrastination, delays, and mistakes, and unless the decision be made within thirty days to carry out a program in 1919, as I am suggesting, we will be too late again.

"With all the furniture companies in Grand Rapids, Mich., and with all the metal works in Michigan and Ohio and other States, and other great facilities and resources in this great country, 10,000 machines of the single type, like the Handley-Page aerial dreadnought, can be produced within the time above indicated, with the supervision of Mr. Handley-Page and his technical staff to do the engineering work. We will not disorganize a single factory or system employed by the Government now, only in so far as it is necessary to carry out the general production program, and from the organized state that some of these factories are now in we could soon be in an enormous production, making the machines identically the same as they are made in Engalnd. But to do as I have outlined, the Government must decide to act within thirty days.

2,000 by January 1

"If the program I am outlining is adopted we can have 2,000 of these four-engine type aeroplanes delivered in France by the Atlantic air route by January 1. I am not suggesting, however, that present production should be stopped, as all the aeroplanes will be needed and can be used, but I must say that had proper methods been adopted by the production board 2,000 of this type could have been on the western front by the Spring of this year, provided, of course, that the geared Liberty motor production had come through on time according to all promises made last year.

"We should bury our national pride and stop thinking about or trying to produce an all-American aeroplane. If there is an American aeroplane made today that can do it, let it be attempted. If it is not produced, but designed, then let it be known how long it will be before it is produced and what performance can be expected. If this takes longer than thirty days it will be impossible for any successful achievement on the western front in the Spring of 1919. I say, no matter whether it be English, French, Italian, Chinese, or even German, if it is good take it and defeat the Germans with it. This is what the Germans did with one of the first Handley-Page aeroplanes made, which unfortunately landed in a German airdome in Northern France, due to mist and fog, and the present type of Gotha German aeroplane is a reproduction of the earlier type of the Handley-Page, and I believe every one knows what the Gothas have been doing in England ever since production on these was started in Germany."

THE AERIAL MAIL SERVICE BETWEEN NEW YORK, PHILADELPHIA AND WASHINGTON IS PROVING TO BE OF GREAT VALUE IN DEFINING PROBLEMS TO BE SOLVED TO PERMIT AERIAL NAVIGATION ON SCHEDULE TIME FOR WAR AND UTILITARIAN PURPOSES

THE military authorities in charge of the Aerial Mail lines, together with the Postal authorities and the Aero Club of America officials have held a number of conferences to define the problems to be solved and the possible way of solving them.

When the aerial mail line started there was no data available regarding meterological conditions and the ways and means of overcoming the difficulties created by changing weather conditions. The aviators had had very little experience in cross-country flying, and there were no definitions of the conditions to be met in the attempt to fly daily on schedule time between New York, Philadelphia and Washington.

After a series of conferences between the military, Postal and Aero Club of America authorities, the following problems and possible solutions have been defined, and their definition promises to bring about developments of great importance from a military as well as a utilitarian standpoint, and greatly advance the possibilities of aerial navigation over great distances.

The following authorities participated in the various conferences:

Captain Charles Andrew Willoughby, A. S. S. C., in charge of the Aerial Mail Service for the Army; Captain B. B. Lipsner, of the Lubrication Division, Department of Aeronautics, U. S. Army; Second Assistant Postmaster General Otto Praeger, Louis C. Boldenweck, superintendent of the Aerial Mail Service; Alan R. Hawley, President, and Henry Woodhouse, Member of the Board of Governors, Aero Club of America; August Post, Secretary, Aerial League of America, Lieut. Torry H. Webb, Lieut. Paul Culver, Lieut. C. H. Miller, Lieut. James C. Edgerton, Lieut. Steven Bonsal, Lieut. J. Kilgore, Richard Vreeland, Assistant Superintendent of Mails, of New York; George L. Conner, Chief Clerk to Mr. Praeger; and Mr. Harry L. Hartung, representative of the Post Office Department at Belmont Park; Professor Charles Lane Poor, and Captain Robert A. Bartlett.

Problems to Be Solved to Make the Operation of Aircraft on Schedule Time Between Points of Departure and Terminal

The problems have been defined as follows:

(1) Difficulties to be overcome in flying from points of departure to terminal.

(2) Conditions to be met in landing upon arriving over the terminal.

On the whole, the problem of meeting the conditions after arriving over the terminal is the most difficult problem, because the fog or mist may screen the landing place and the aviator, therefore, must face the risk of running into houses if he flies low to find the landing place through the low-flying clouds, fog or mist.

Ascertaining the Extent to Which Visibility Is Possible Through Clouds, Fogs and Mists

In a general way, the weather conditions under which aviators have to fly can be characterized as follows:

(a) Ideal.
(b) Fair.
(c) Occasional clouds.
(d) Frequent clouds.
(e) High winds.
(f) Thick clouds.
(g) Thick clouds and high winds.
(h) Rain.
(i) Storms.
(j) Combination of storms and heavy fogs.

Aviators after leaving the point of departure under fairly good conditions may meet any of the above mentioned conditions, and may successfully overcome them, but the great difficulty is when they arrive at the terminal to find the landing field screened by fog or mist or low-lying clouds. The problem of landing is not only one of visibility but also of finding the direction of the wind, so as to land against the wind, since high winds can exist with thick fog, which makes a very difficult combination.

Weather Conditions Inconstant

Weather conditions are not constant, and the aviator who has been advised as he started from Washington that the Philadelphia or New York station was screened by fog may find upon arrival that the wind and sun have cleared the fog away and conditions are perfect for landing. The opposite may also be true. Therefore, unless the Weather Bureau gives conclusive reports that impossible weather conditions will exist for a period of time in that particular locality, the pilot must take a chance and fly under almost any conditions—until by continuous aerological observation there can be compiled reports of prevailing weather conditions in a given locality for a given period of time. Then the best localities will be selected for landing places.

Possible Solutions of the Problems

The following possible solutions have been defined to the problems:

(1) The establishing of aerological stations for the observation, measurement and investigation of atmospheric phenomena according to the plans developed by the Weather Bureau in making similar studies in Oklahoma, North Dakota, Texas, Georgia and Indiana. This will provide the data required to ascertain the prevailing atmospheric conditions and supplying data regarding the time required for mist and fog to clear up under different conditions, the extent of visibility through mist, fog and different cloud formations, etc. A study can also be made of local air currents, as the clearing of mists depends to some extent on prevailing wind currents.

(2) The use of aeroplanes equipped with two or more motors. The use of aeroplanes equipped with two or more motors will permit a pilot to fly low upon nearing the terminal and look for the landing place without fear of trouble through having to make a forced landing in case the motor stops. Having two motors, he will be able to continue to fly if one motor stops. At the same time, having two motors, he will also be able to fly under throttled power and extend the life of the motor to 500 or 600 hours or more, which is not possible if the motor is flown at full speed most of the time.

(3) In view of the fact that the aerial mail service affords extensive training in flying across country and dead reckoning required to fit the aviators for bombing, patrol and U-boat hunting duty, justifies the establishing to two or more auxiliary fields near the main station, so that if the aviator, upon reaching the station, finds the ground banked with fog, he may fly to an auxiliary field from five to fifteen miles away, which does not involve a serious delay in the delivery of the mail.

(4) Use of Radio Direction Finders to lead the aviator to the landing station under almost any condition.

(5) Employment of sounds, the same as at sea, using long and short whistle blasts and sirens to direct the aviator.

(6) The employment of lights to direct aviators was discussed but the general opinion was that its use was very limited, as lights do not penetrate fogs.

The Army authorities and aviators are working energetically with the cooperation of the postal and Aero Club of America authorities to solve these problems, the solution of which will be a valuable contribution to the advancement of the aeronautic art and science. They are doing pioneer work in an entirely new field, where there are no precedents to follow and it is all original research work of great importance.

MR. WOODHOUSE'S WORK COMMENDED

THE Executive Committee of the Aero Club of America, at its June 26th meeting, on the occasion of Mr. Woodhouse's 34th birthday, unanimously adopted the following resolution:

WHEREAS, Mr. Henry Woodhouse, having, in the opinion of the Governors of the Aero Club of America, earned an acknowledgment of their appreciation of his extraordinary achievements on behalf of the aeronautical movement, the movement for national preparedness, and the club, and

WHEREAS, The many undertakings initiated and so successfully carried out by Mr. Woodhouse and his associates having proven of great value to the country and the cause of the Allies, and the club, and

WHEREAS, The creation of aeronautic reserves and aerial coast patrol units, trained at private expense, resulted in giving the War and Navy Departments about 300 aviators, who were the first aviators to be sent to France; and

WHEREAS, By his exceptional vision, good judgment and energetic efforts Mr. Woodhouse has contributed in many ways to creating interest in the war, building the Air Forces, the Liberty Loans, the Aero Mail, delivering aeroplanes across the Atlantic, the French Aerial Warfare Exhibit and other activities of great importance as contributions towards winning the war; together with other services which he has rendered and

WHEREAS, By these activities and his untiring devotion to the cause for which the Aero Club of America stands, and to his colleagues, Mr. Henry Woodhouse has won the admiration and esteem of his fellow governors, therefore

Be It Resolved: That the Board of Governors of the Aero Club of America hereby tenders to Mr. Henry Woodhouse its thanks, and this expression of its appreciation of the invaluable services which he has rendered to the nation, the aeronautic movement, and the club.

AIR SERVICE INSTITUTE HAS CLOSE TO 2,000 MEMBERS—TO ESTABLISH FORTY AERONAUTIC LIBRARIES

THE Air Service Institute has been progressing in bounds. Although the plans to organize the Institute were only made on March 16, the Institute has already close to 2,000 members and it has achieved an international standing.

The Institute's last step to help the Air Service is a plan to establish an aeronautic library at each of the Army, Navy and Marine Corps Air Stations, schools and administrative divisions. Each library is to consist of selected aeronautic books and publications. Everything will be in duplicate, so one copy will be kept in the Commanding Officer's office and the other copy will be available to the officers and cadets.

Owing to the extraordinary demand on the time of officers in France, created by the upset conditions due to the German drives, Mr. and Mrs. Benjamin Thaw, the father and mother of Major William Thaw, the president of the Institute, have found it necessary to act for him in many matters. The nomination to the Presidency of the Air Service Institute was, therefore, accepted for Major Thaw, and Mrs. Thaw, who was to sail for France shortly, was to advise him—which has been done.

Mrs. Thaw is also to ask Major Thaw to select one of the most prominent American aviators to take the place of the late Major Lufbery as Vice-president of the Institute.

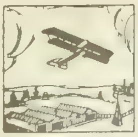
When the plans for the organization of the Institute were made and put in writing there was adopted the principle that, to quote:

"Whatever is done must be done without taking Military and Naval men from their important work and without expense on their part, because they have already expenses which are excessive, compared with their small income and the high cost of living."

This is a very high-minded plan which is very thoroughly appreciated by the Air Forces. The letters of appreciation received by the Institute from officers would fill many pages.

The Institute has offices at the Union Trust Building, Washington, D. C., and at 297 Madison Avenue, New York City, and 42 Fambourg Paissonniere, Paris. The office of Lieutenant Granville A. Pollock, late of the Lafayette Escadrille, the Secretary of the Institute, are at Washington and all communications should be addressed to him there.

The Institute owns its own publication, *Air Power,* late *Navy Air Pilot,* which is now being moved from Pensacola, where it has been published for the past three years, to Washington, D. C. The dues are only $2.00, for which members receive *Air Power* for a year.



THE NEWS OF THE WEEK

Senate Allows Ryan to Form Aero Corporation

Washington.—John D. Ryan, Director of Aircraft Production, was authorized by the Senate June 28 to form an aircraft production corporation with a capitalization of $1,000,000

The action looking to the formation of the corporation had been taken up last week, but it met with opposition from Senator Reed, who desired that the subject be laid before the Military Affairs Committee. This was done by Mr. Ryan and the legislation will go to the House as new.

As adopted by the Senate, the Director of Aircraft Production is empowered to form the corporation. He must subscribe and vote, for the Government, not less than a majority of the stock. It is further provided that the corporation must be dissolved within a year after peace has been declared

The new corporation will closely resemble the Emergency Fleet Corporation and the War Finance Corporation, which were created for the period of the war

Chicago Aeroplane Inquiry Probably Ordered by Hughes

Washington.—Federal Grand Jury investigation of the Chicago branch of the Aircraft Board soon may include other cities where there has been aircraft activity

Announcement of the inquiry in Chicago by the United States attorney there gave rise to reports that the Hughes investigation of the aircraft situation had reached a point where instructions to act, through the medium of grand juries, would be sent Federal prosecutors in other cities by Attorney-General Gregory.

Washington is believed to have ordered the Chicago investigation. The prosecutor in that city, fully aware of the magnitude of the Hughes inquiry, hardly would have begun an independent quiz without first having obtained the sanction of the Attorney-General.

The Hughes inquiry has been in progress here upwards of six weeks. It has been a steady, daily grind behind closed doors, with the former Supreme Court Justice in the role of interrogator.

While Mr. Hughes will necessarily report in full to President Wilson, who asked him to conduct the investigation, it is also up to him to "punish the guilty," if there are any.

Discovery of irregularities or graft naturally would result in action by Federal prosecutors in the districts having jurisdiction, as in the case of the Chicago investigation, where, it is charged, Department of Justice agents have collected evidence showing "that money flowed through the office like water," and rich men's sons were given high salaried positions without regard to their qualifications.

Big Plane Coming for First Trip

Plans for the proposed aeroplane flight across the Atlantic assumed definite form when it was said that a 2,100 horsepower Caproni machine equipped for such a test had already been shipped from Italy to this country.

Officials of the Aero Club of America, which is arranging for the great undertaking, expressed the opinion that things would be in readiness to attempt the flight by September or October at the latest.

The triplane now on its way from Italy is fitted with three giant motors and embraces every improvement known to the art of aeroplane building. It is the very latest model of the Italian inventor and is designed to remedy every defect that developed in the earlier models.

Use of the machine for the proposed flight was obtained by the Aero Club through the offices of Lieutenant Belloni, of the Royal Italian Flying Corps now in this country.

Army Cognizance Board Changes Headquarters

The Joint Army and Navy Board on Aeronautic Cognizance has, due to the reorganization of the Signal Corps, been transferred from 1607 H Street, N.W., to Building "D," 6th and B Streets, Washington, D. C., and the section is under the supervision of Lieutenant W. W. Williams

Ralph A. D. Preston, of the Goodyear Tire & Rubber Co., who has been commissioned a Lieutenant (Senior Grade) in the Naval Reserve

Preston Commissioned in Navy

Ralph A. D. Preston, who has been in charge of the Goodyear Tire & Rubber Company's Flying Field, near Akron, Ohio, where instruction in ballooning is given to student officers of the army and navy, has received a commission as lieutenant, senior grade, in the United States Naval Reserve Flying Corps. His headquarters are now in Washington, D. C. He has been placed in charge of repairs on U. S. Navy airships and will keep in touch with all work at the various naval air stations.

Despite Lieut. Preston's youth he is prominent in lighter-than-air aeronautic work, and probably has no superiors in this country in the matter of piloting balloons of all kinds. He was a member of the Goodyear crew that won the James Gordon Bennett Cup race at Paris in 1913, and the following spring won the elimination balloon contest at Kansas, qualifying as the American entrant in the International Balloon Race to be held at Paris in the fall of 1914. This race has not yet been flown on account of the war.

Lieut. Preston has represented the Goodyear Tire & Rubber Company in various capacities in Europe and South America and has had practical and scientific experience both as a tire engineer and as an aeronautical engineer. Since his assignment to the Goodyear Flying Field, has trained many young men who are now piloting kite balloons and airships in harbor and coast patrol, both in this country and in France, and has also directed a great deal of successful experimental and development flying. His appointment to his present important post in the United States Naval service augurs well for the rapid development of the operation of lighter-than-air craft in that service.

Air Raid Sirens Tested

New Yorkers within a radius of sixteen blocks from the plant of the Edison Electric Light Company, at Fortieth street and First Avenue, heard on June 26th for the first time the tones of the siren that with scores of others will warn them to scurry to the cellars to dodge the bombs of enemy aircraft. Shortly after 9 o'clock the siren on the roof of the Edison plant took up its wail, but the police had previously prepared those in the vicinty by telling them that the test was to be made.

Within the immediate vicinty of the Edison building the siren could be easily heard, but several blocks distant the roar of the city's traffic mingled with the warning wail until at a distance of sixteen blocks the cry was drowned entirely. The siren was tested for five minutes. More sirens, however, are to be placed about the city and their megaphone volume will be itensified.

Record Aerial Mail Trip

Government officials visited Belmont Park on June 26th to inspect the work of the aero mail aviators. H. L. Hartung, who superintends the aero mail service at New York, acted as guide.

Lieut. Webb started at 11:59 with 125 pounds of mail and carried as passengers Inspector Green and Lieut. B. M. Bryant of the Signal Corps. The trip was made in record time, in spite of the extra weight, the running time between New York and Philadelphia being forty-five minutes.

Inspector T. S. Connor, chief clerk of the Second Assistant Postmaster-General's Department, expressed satisfaction with results.

He called attention to the fact that the record of the previous week was 100 per cent, not a trip being missed.

Maj. Bishop Brings Down His 72d Hun Plane

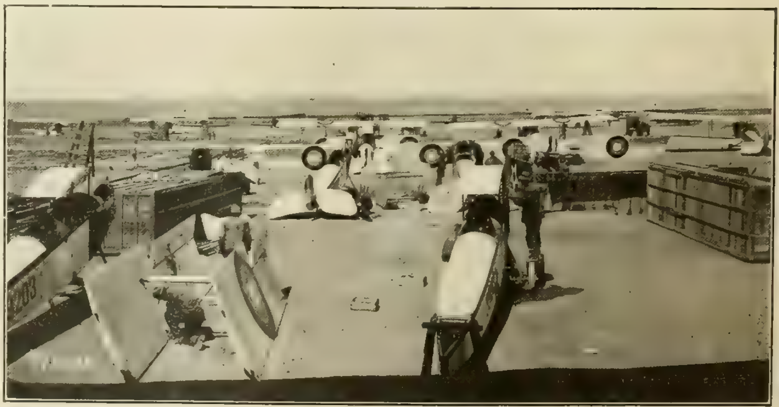
Toronto, Ont.—Major William Avery Bishop, Canada's champion, has become world's champion air fighter, adding since his return to France four weeks ago twenty-five aeroplanes to his earlier record of forty-seven. He cabled on June 23rd as follows:

"Returning to England permanently. My total now seventy-two." Major Bishop has been appointed to the British Air Board and his fighting career is closed.

His nearest rival was the German, Richthofen who had seventy planes and ten balloons, including those crashed behind Allied lines.

Mimic Night Air Battle Fought Over Baltimore

Baltimore—Two big aeroplanes from the Potomac aviation field, one representing a German bomb thrower, piloted by Lieut. Theodore Maynz, with Lieut. William F. Brown gunner, and the other an American defender, piloted by Capt.



Cadet aviators constructing aeroplanes at Rockwell Field, San Diego.
© Committee on Public Information.

Percival Dodge, engaged in mimic battle over Baltimore city on June 25th.

The mimic battle was arranged in aid of War Saving Stamps.

Capt. La Guardia Makes Long Flight to Fetch Machines

Rome.—Capt. Fiorello H. La Guardia of the American Flying Corps and representative in Congress from New York City, recently made his first long cross country flight in a Caproni aeroplane. He went to the north of Italy to get machines for the American training school and, because it would take too long to ship them by train, the Captain decided to bring them by air. He was assisted by Lieutenants Spencer Kerr of Baltimore, Mowatt Mitchell Wandell Hauch of California and Harris and Agar.

The exact route taken by the American aviators cannot be mentioned but it can be said that it was longer than from Rome to Milan. The Americans made the flight in four hours.

First Wounded Airman to Get Noted Guitar

The first wounded American aviator to return to the United States will have something to come back to besides an adoring public. Frances Starr's guitar which she played in "Rose of the Rancho" is to be presented to that hero by Mrs. Orlando Rouland, 130 East Fifty-seventh Street, who is collecting musical instruments for military men.

Concrete Landing Beach for Navy Sea Planes

Washington, D. C.—A concrete landing beach with hangars and other structures for the accommodation of naval seaplanes is being built by the Navy Department on a tract of reclaimed land on the flats on the left bank of the Anacostia river.

The temporary use of land, covering an area of 1,500 by 600 feet, has been authorized by the Secretary of War, who has jurisdiction in the premises. The station is located near Giesboro point and is almost directly opposite the Army War College.

In granting its use for naval seaplanes it was provided that the structures should be removed within six months after the close of the war. It was also provided that there should be no interferences with navigation of the river.

New Flying Field Opened

Washington, D. C.—The War Department authorizes the following statement: Mather Field, at Sacramento, Cal., was opened for training aviators on June 24. This is one of the new training fields for flyers recently completed for the Department of Military Aeronautics and is the twenty-eighth field in active operation. It was named in honor of Second Lieutenant Carl S. Mather, Signal Reserve Corps, Aviation Section. Major D. C. Emmons, J. M. A. S. C., is commandant at Mather Field.

A New Publication

Aerial Age has much pleasure in welcoming to the fraternity of aviation publications *The Call Field Engineer.*

This is a new publication in magazine form being, as its name implies, the organ of the U. S. Aviation School at Call Field, Wichita Falls, Texas. It is quite a pretentious venture, printed on heavy paper in colors. It contains a diversified assortment of subjects, from well written technical articles to some very interesting short stories. The work is all contributed by the personnel of the Field, and is most creditable to it. Lieut. H. E. Willingham is the Editor.

Royal Flyers Drop Sam Brown Belt

Washington, D. C.—"The Royal Air Force is the only arm of the British service whose officers do not wear the 'Sam Brown' belt. All of the allied troops have adopted the 'Sam Brown' belt. It was first worn by the British, but the French adopted it and then all the officers of the allied services, the Americans in France being the last to take it up. In the beginning the members of the Royal Flying Corps wore the belt, but when the air force was reorganized and consolidated under the name of the Royal Air Force the 'Sam Brown Belt' was abandoned by the airmen.

"The Royal Air Force is an independent branch of the British service, separate entirely from the Army and Navy.

"Some persons do not understand the insignia of the British soldiers. It may be noticed that the officers and men wear stripes on the right sleeve below the elbow near the cuff. The first, or lower one, which is red, indicates that the soldier entered the zone of active operations in 1914, and one additional stripe (blue) is added every year of service thereafter. There is scarcely a regiment of British soldiers that has a hundred of its original quota still in active service."

Air Postage Cut to 16 Cents

Washington.—The Post Office Department announced on June 28 that after July 15 the postage on aero mail will be reduced from 24 cents to 16 cents for the first ounce and 6 cents for each additional ounce or fraction.

This is a 6 cent rate for postage and the usual 10 cents for special delivery.

Commissions for 1700 Aviators

Washington.—Commissions as first and second lieutenants in the Non-flying Section of the Signal Corps Reserves will be awarded to 1700 cadet flyers now training in British, French and Italian flying schools. After they have been qualified as flyers the commissioned officers will be transferred to the flying section.

First German Seaplane Downed

Washington.—Ensign Stephen Potter, U. S. Naval Reserve Force, who was killed in action on April 25, is credited with shooting down the first German seaplane destroyed by an American naval aviator. On March 19, 1918, a long-distance reconnaissance of the German coast was made by large American flying boats operating from a British Royal Air Force Station. Two American naval aviators accompanied this expedition, and one of them, Ensign Potter, was successful in shooting down a German seaplane which attacked the formation. A second enemy machine was put to rout at the second time. After making a highly successful reconnaissance flight the seaplanes returned to their base, having sustained slight damage. The return trip was made in 6 hours and 33 minutes of actual flying.

From the Flying Fields

A hospital airship is the latest innovation at Ellington Field. The ship has been assembled for its initial flight. It will at once be placed into active service.

The machine is a Curtiss JN4H type, with an Hispana-Suiza motor. All interior parts have been coated with white enamel, including the struts and landing gear, and, instead of the usual insignia on the wings, there are large red crosses. A gilded Caduceus is on either side of the rudder and the number of the plane is 38175.

First Lieut. William H. Becker has been appointed assistant to First Lieut. Frank M. Bartlett, officer in charge of flying of the Kelly Field Flying Department. He succeeds Lieut. Newell E. Thomas, who has been transferred elsewhere.

The Goodyear D12 Makes 360-Mile Journey

The performance of the airship D12 in a 360-mile flight from the Goodyear Balloon Field, near Akron, O., to Dayton, O., and return, marks the first successful long distance airship flight made in this country. The accomplishment is noteworthy in that it is indicative of the possibilities of a most important branch of our aeronautical service that has heretofore commanded but a small share of public attention, because of the predominance of an almost unlimited aeroplane program.

The journey of the D12 was the longest in which any American airship has ever flown to a definite objective, made a successful landing and returned to its hangar successfully. The start was made from Akron with pilots Ralph H. Upson and Herman Kraft in charge. Flying over Springfield, Ohio, at an altitude of 4,000 feet, the big airship was met by two Liberty-motored aeroplanes from the Dayton Wright flying field. Under convoy of these two planes the D12 arrived at Dayton, and after circling above the city several times, amid the blowing of whistles and ringing of bells, landed gracefully in the flying field where sufficient space had been cleared to receive it.

Upon emerging from their car the two pilots were warmly greeted by the aviators there, and great interest was shown both in their craft and their accomplishment. As there was no hangar at the field large enough to contain the airship, it was secured for the night under guard supplied by Col. Deeds.

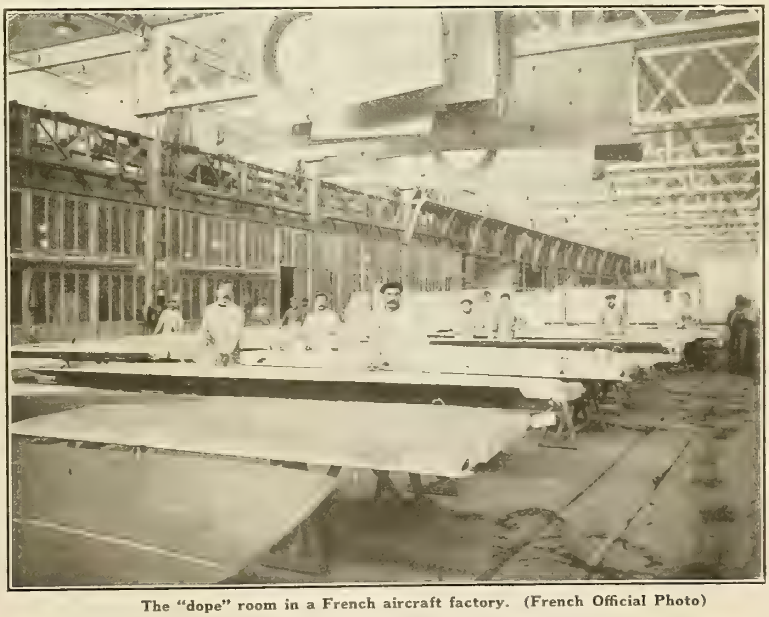
At 10:40 the next morning pilots W. Pouchot and J. A. Boettner, took charge of the airship and started on the homeward journey, accompanied by a squad of twenty-five aeroplanes that acted as a convoy for about ten miles. Secretary of War Newton Baker, arrived at the flying field just as the ascent was being made, and watched the big airship soar away, as long as it was visible. In just four and one half hours it was quietly resting in its hangar, having finished the longest flight of lighter-than-air craft of the dirigible type, ever made in Ameirca.

The visit to Dayton was timed during the convention of the Society of Automotive Engineers, and many aeronautical engineers who had not previously had the opportunity of seeing an airship in action, took advantage of this opportunity to examine it.

That the operation of airships of this type need not necessarily be confined to balloonists of great experience and reputation, is proven by the successful flight of the two pilots who accomplished the return journey. These two young men were trained to fly balloons in the Goodyear Balloon School, just as thousands of other young men are being trained in our mammoth aviation camps to operate aeroplanes. Their flight was equally as successful as that of the two veterans who took the airship to Dayton.

Aircraft of this type are playing a very important part in the war. As coast and harbor patrols their work has been effective. In the recent submarine scare on our eastern coast aircraft of this type joined in the search for the elusive U-boats. In many ways such airships are performing creditable service—not as spectacular nor as widely heralded as that of aeroplanes, but performing efficiently and watchfully. Many pilots that have received their training in the Goodyear School, which is constantly training student officers of the U. S. Navy, are now flying airships in coast patrolling in France.

The government has recently taken up the use of these airships on a more extensive scale than before, which portends the training of many more young men as pilots for this type of aircraft.



The "dope" room in a French aircraft factory. (French Official Photo)

The AIRCRAFT TRADE REVIEW

New Glenn Martin Plant Finished

Cleveland.—The new plant of the Glenn L. Martin Co. has been dedicated. The company will complete one advanced type aeroplane every 10 days until October, when production will be speeded up to one plane daily.

Detroit S. A. E. Moves Offices

Detroit.—The offices of the Detroit section of the Society of Automotive Engineers will be located at 701 Book Building on and after June 21. The society will inaugurate an engineering reference library for the convenience of its members in checking up technical information, and a file of the leading engineering journals will be on hand.

Prohibit Castor Bean Imports

Washington.—Importation of castor oil or castor beans from the West Indies, Mexico, Central America, Columbia and Venezuela is prohibited by the War Trade Board except when the United States Government is the consignee or when the importation is approved by the Bureau of Aircraft Production. Licenses for importation of castor beans and castor oil have been revoked as to shipments made after June 10, 1918. All applications for the importation of these commodities from the countries named when the consignee is other than the United States Government will be referred to the Bureau of Aircraft Production for approval.

Personal Pars

C. T. Chenevert has been commissioned a senior lieutenant in the Bureau of Aviation Operation, to supervise navy trucks in France. He was formerly vice-president of the Denby Motor Truck Co., Detroit, Mich.

Charles B. Wilson, president of the Wilson Foundry & Machine Co., Pontiac, will assume the added duties of assistant general manager in charge of production of the Curtiss Aeroplane & Motors Corp., Buffalo.

Harold N. Bliss, formerly production manager of the engine department of the Timken-Morse Aircraft Corporation, is now superintendent of the engine department.

Howard Emery, who was manager of the Detroit plant of the Aluminum Castings Co. some years ago and was later transferred to the managership of the Manitowoc plant, has returned to the Detroit factory to occupy the position of manager. This position was recently vacated by Charles B. Bohn.

Charles C. Hanch, treasurer of the Studebaker Corp., South Bend, has been appointed chief of the Automotive Products Section of the War Industries Board. He succeeds H. L. Horning, whose resignation was accepted the last week in May.

The Warner Airplane Control Co. have done a real service by erecting guide posts at the Dayton aviation fields

Mr. Hanch will assume all of the duties which heretofore have been performed by Horning. He will have complete charge of all automotive purchases both for the United States army and for the Allies, these to include motorcycles, trucks, ambulances, trailers, passenger cars, tanks, artillery tractors, armored cars, aeroplanes, stationary gas engines and all automotive accessories.

Army Aircraft Service Offices Under One Roof

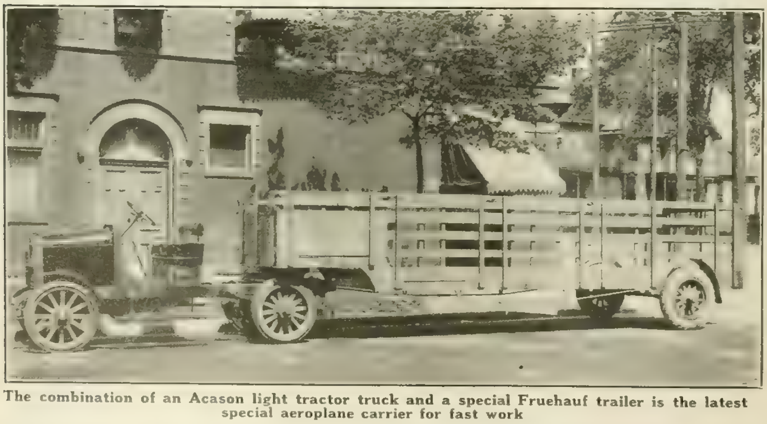
The War Department authorizes the following statement:

The office of John D. Ryan, Director of Aircraft Production and chairman of the Aircraft Board, was moved from the Munsey Building to Wing 8, second floor, Building "D," Fourth Street and Missouri Ave NW.

The Aircraft Board has been assigned offices in the Fourth Street wing of the same building. The Bureau of Aircraft Production is now located in the Fourth Street end. The removal of the offices of the Director of Military Aeronautics to the Sixth Street or Western end of Building "D," brings the two main branches of the Army Air Service under one roof.

The Washington office of the Aerial Mail Pilots and the Washington Aviation Examining Board are also now located in the Sixth Street end of this building. Offices have also been assigned to the British, French and Italian Aviation Missions in the same section of the building.

All the telephones of the Army Air Service are now listed under the War Department exchange.



The combination of an Acason light tractor truck and a special Fruehauf trailer is the latest special aeroplane carrier for fast work

Packard Ships 1,000 Aeroplane Motors

The one thousandth Liberty aeroplane engine produced by the Packard Company was shipped from the factory last week, just a year to a day from the sending to Washington of blue prints and parts which formed the start of the Liberty motor design.

The dispatching of the one thousandth engine was celebrated quietly, but none the less exultantly, by the men who within a year have had the successive responsibilities of producing the first Liberty engine by hand, the first Liberty engine to fly, the first Liberty engine made from tools designed for quantity output, and now their first thousand perfected engines.

Among those who witnessed the crating of the motor for shipment was the young engineer who on May 29, 1917, took down to Washington a trunk, checked as personal baggage, which contained complete blue prints and an all-steel cylinder of an aviation engine.

When Liberty engine No. 1,000 was completed a telegram was sent by the two Liberty engine builders to President Wilson and Secretary Baker announcing with "solemn thankfulness" the completion of the first thousand. In reply Secretary Baker wrote his congratulations, praising the "most commendable zeal and spirit with which the task has been accomplished."

The Acason Trailer

A motor wagon for aeroplanes is one of the war developments. It is now possible to take a complete plane, run it up on skids aboard a Fruehauf trailer and then have an Acason light type tractor truck haul it at good speed to its destination. The practise is now under way in certain sections of the country when it is desired to move planes from one place to another without using their own power. In the case of disabled planes it is handy to move the entire plane from wherever it may be into the reservation hangars where it can be given speedy and proper attention.

The trailer is 25 feet long, 7 feet wide, with racks 48 inches high. It is equipped with 38 x 7 Goodyear all weather tires on the trailer and solid Goodyear on the Acason Motor Truck Company's light type tractor. The trailer has a capacity of 3 tons. Its development is the result of French war experience.

It is believed that the combination will prove of much value in the commercialized aeroplane activity which is planned for after the war period. It has caused favorable comment among prospective commercial aeroplane builders in Detroit, which city is looking forward to being one of the big aeroplane manufacturing centers at the conclusion of the war.

Bosch Magnetos Re-christened "Liberty"

New York.—In so far as Australia is concerned, Bosch magnetos are now known as Liberty magnetos. The change in name follows an order of the Comptroller General of Customs for Australia prohibiting the importation of magnetos bearing the name Bosch. The magnetos themselves are not banned, but the name is, and hence, on all shipments to Australia, Tasmania and New Zealand the name Bosch has been supplanted by the name Liberty. The edict applies to magnetos shipped separately or as part of the equipment of cars, trucks, motorcycles, etc., but instruments shipped prior to June 20 will be admitted under the name Bosch. The Bosch Magneto Co. expects to ship 7,000 instruments during the current twelvemonth.

N. Y. U. Faculty to Aid in Aircraft Work

By arrangement with the Navy Department the scientific faculty of New York University will be organized into a committee of research and consultation to help the aircraft programme.

The Chairman will be H. M. Avram of Slocum, Avram & Slocum, engineers and industrial managers, who is a lecturer on industrial engineering in the School of Applied Science at University Heights.

Problems connected with aeroplane construction, improvement and operation will be submitted to the committee and assigned to members whose scientific equipment fits them for the special task to be performed. The laboratories and workshops of the university will be used for the experiments and mechanics will be employed under the direction of the professors to assist in working them out.

REPORT ON AIRCRAFT SUPPLY OF GREAT BRITAIN AND DISCUSSION OF THE DIFFICULTIES INVOLVED IN PRODUCTION

The Secretary of the Smithsonian Institution has prepared the following extract from the Report for the year 1917 *of the War Cabinet of Great Britain relating to supply of aircraft. It is reprinted with the permission of Lord Reading, the British Ambassador.*

The description given of the difficulties in the way of obtaining a supply of aircraft is so accurate and is so general in its application to all countries that it is believed it should be given as wide a circulation as possible in America. Its application to the American aircraft situation is evident if we remember that Great Britain has been at war since August, 1914, *and that every resource of the country, famous for generations as the center of mechanical developments, has been applied to the problem of the production of aircraft. This enables us to appreciate more clearly the progress made by the United States in* 1917-18:

Supply of Aircraft

[The above recital indicates generally what steps have been taken in matters of administration and control.] It should be supplemented by some general account of the measures taken as regards supply of aircraft and the development of that supply.

In endeavoring to describe the measures taken to meet the aircraft needs of the Navy and Army, the writer is at once confronted by the fact that the information desired by the country is precisely the information desired by the enemy. What the country wants to know is what has been the expansion in our Air Services; whether we have met and are meeting all the demands of the Navy and of the Army, both for replacement of obsolete machines by the most modern types and for the increase of our fighting strength in the air; what proportion of the national resources in men, material and factories is being devoted to aviation; what the expansion is likely to be in the future. These are precisely the facts which we should like to know with regard to the German air service, and for that reason it would be inadmissable for us to supply Germany with corresponding information about ourselves by publishing a statement on the subject.

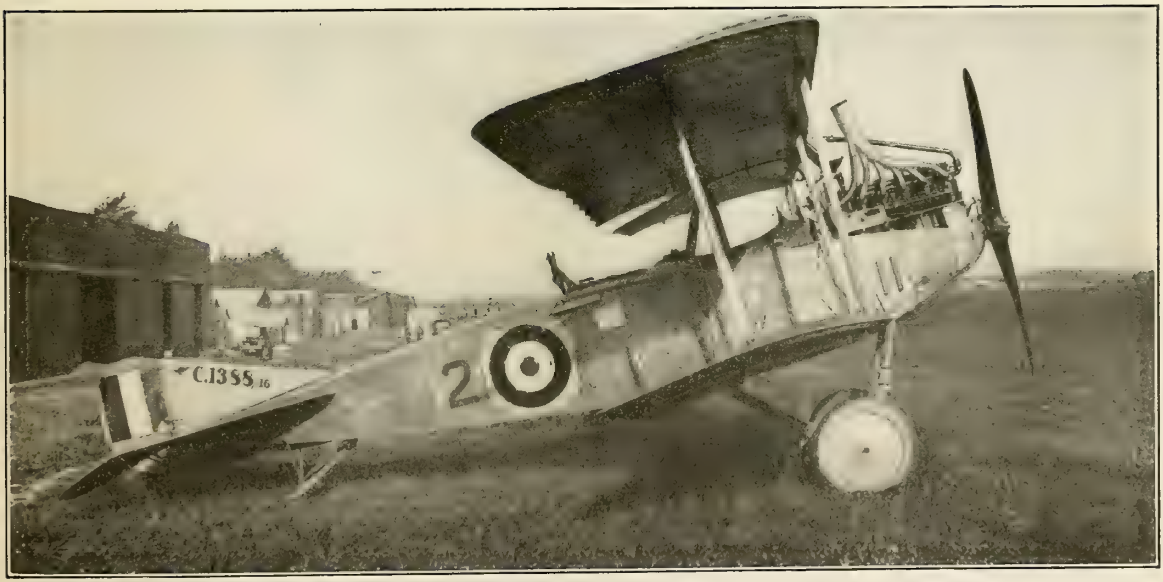
It can be said that the expansion of our Air Services is keeping pace generally with the growing needs of the Navy and the Army.

The brilliant part played by the Royal Flying Corps and the Royal Naval Air Service in the battles of the Somme, Vimy, Messines and Ypres has been described by the Commander-in-Chief, who has also borne frequent testimony to the inestimable value of the work performed daily and nightly by the two air services. It is fair to say that not even the well-known superiority of our airmen over those of the enemy would have enabled them to have earned the Commander-in-Chief's praise in so unstinted a measure unless they had been supplied with satisfactory machines and equipment from home. It is rather the fashion to criticize the quality of our machines. Most of the critics, however, are ignorant of the technical and manufacturing difficulties which have to be overcome in order to keep up a constant and increasing supply of the most up-to-date machines. Not only are the techincal difficulties and the resultant research and experimental work formidable in themselves, but the task of building up in war time, without seriously affecting the requirements of other services, a new industry of a most highly skilled character necessarily puts a heavy strain upon the organizing and manufacturing ability of the country. The growing realization of the increasing importance of aviation as an artificer of victory has recently been reflected by the concession of first priority to labor and materials required for aircraft production.

The nature of the duties performed by the Royal Naval Air Service, both in conjunction with the fleet and from naval bases, makes secrecy essential to success. It is, unfortunately, **inevitable,** therefore, that the public should remain in the dark on this subject; but the Germans, who in this matter are perhaps the best judges, have good reason to know and to regret the great and growing activities of the Royal Naval Air Service. All that has been said regarding the difficulties of supplying the requirements of the Air Forces operating over the land applies equally to the supply of those which operate over the sea. In both cases difficulties are being overcome and the outlook is improving.

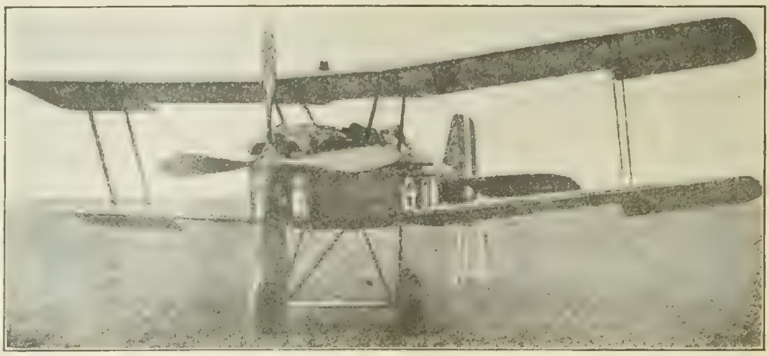
The science of aeronautics is in a state of constant and rapid development; improvements in engines, aeroplanes and their numerous accessories are constantly being worked out. But the interval between the discovery of an improvement and its introduction into the service is, owing to technical considerations, very much longer than is commonly supposed. Experience shows that, as a rule, from the date of the conception and design of an aero-engine to the delivery of the first engine in series by the manufacturer, more than a year elapses; the corresponding period for an aeroplane is about one-half as long. Consequently, plans have to be laid for a long period ahead, and these plans are liable to be upset by many uncertain factors. The hopes based upon the promising results given by the first experimental engines of a new design are frequently disappointed owing to difficulties of a bulk manufacture or to

(*Continued on page* 840)



A German machine captured by the French and subsequently used for training purposes. (French Official Photo)

THE ENGLISH S. E. V. A. SINGLE-SEATER FIGHTER



Three-quarter front view of the British S. E.

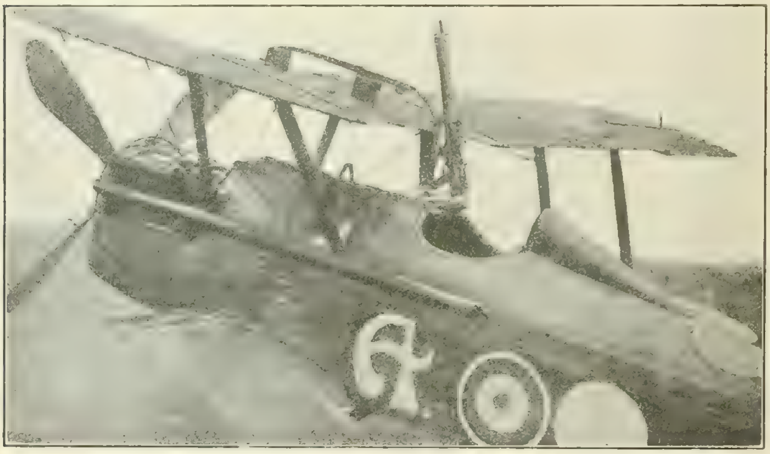
The following description and illustrations published in the German aviator journal, *Deutsche Luftfahrer Zeitschrift*, appears to be an official German report on the British S. E.

The aeroplane in question was built by Vickers, Ltd., and numbered B.507, wearing further as recognition initial or that of a squadron an A as well as a white circle. The propeller is marked: S.E.v.A., which leads to the idea that the older model of this same aeroplane type with the 150 h.p. Hispano motor not geared down is called S.E.v.

The biplane has a surface of 22.8 square metres, and both planes, connected with but one pair of struts to each side, have a span of 8.15 metres, and a chord of 1.52 metres, the gap from the top of the fuselage amounting to 0.45 metre.

No arrow-shape prevails. The V-shape of the equal-sized ends of the upper and lower planes mounted on the centre section and respective body rudiments amounts to 1.71 degrees.

The sight field of range is improved by cutting the centre section in the middle and the lower planes near the body.



The front part of the body of the S. E.

Above the angle of incidence is 5 deg. mean, below by the body 6 deg., by the struts 5 deg.

Both plane spars show sections of I shape, whereas the longerons of the rudiment pieces, running through the body are steel tubes of 1.75 millimetre thickness, and 45 mm. outer diameter. The plane ribs show the usual construction of most British air craft.

There are no compression struts between the spars, some of the ribs being solid struts instead.

The interior wiring of the planes between the body and the struts is carried out in simple profile wire, that of the overhanging ends of thick-ended wire.

A wood strip forms the back edge of the planes. Further, two auxiliary ribs ranging from the leading nose edge to the main spar are arranged between each two ribs.

The fabric is sewed together with the ribs, and is painted yellow below, browned above, as is the fabric of the body. Shoe-eyes are arranged on the underside of the trailing edge of the plane to assess the pressure.

The centre section struts are covered steel tubes. The plane spruce struts rest in long stampings, serving as fixing points of the vertical wiring.

Profile wire is employed for the plane cross wiring with twin wires for those carrying load and single for the counter ones.

The two spars of the upper planes are strengthened further between the centre section and the struts with two wires each. Unbalanced ailerons are hinged to the back crossbar of the upper and lower planes.

The body shows the usual strut cum wire combination, being rounded above with half-circle frames and fairings, and having three-ply wood planking of 4 millimetre thickness to the pilot's seat. Fuselage longitudinals and struts have sections of I-shape, except the vertical struts behind the pilot's seat, which are worked out round.

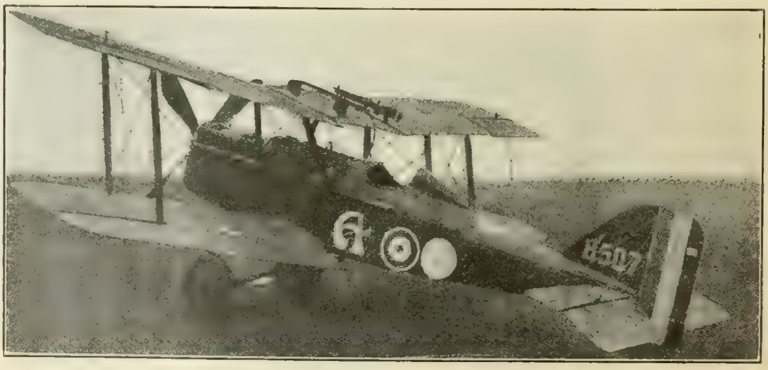
The tail-plane is curved to both sides and fixed to the body, so that the angle of incidence can be varied during the flight within the limits + 4.5 deg. and — 3 deg. To this end the front spar is turnable, while the rear spar, with its wiring, is fixed to a tube, arranged shiftable to the body stern post. This tube rests with a piece of thread in a gear-nut, again resting in the stern-post fixed, yet turnable.

When the nut is turned from the pilot's seat by means of wheel and cable, the tube is displaced upwards or downwards, transferring thereby the same manœuvre on the rear spar of the tail-plane, and thus its angle of incidence changes.

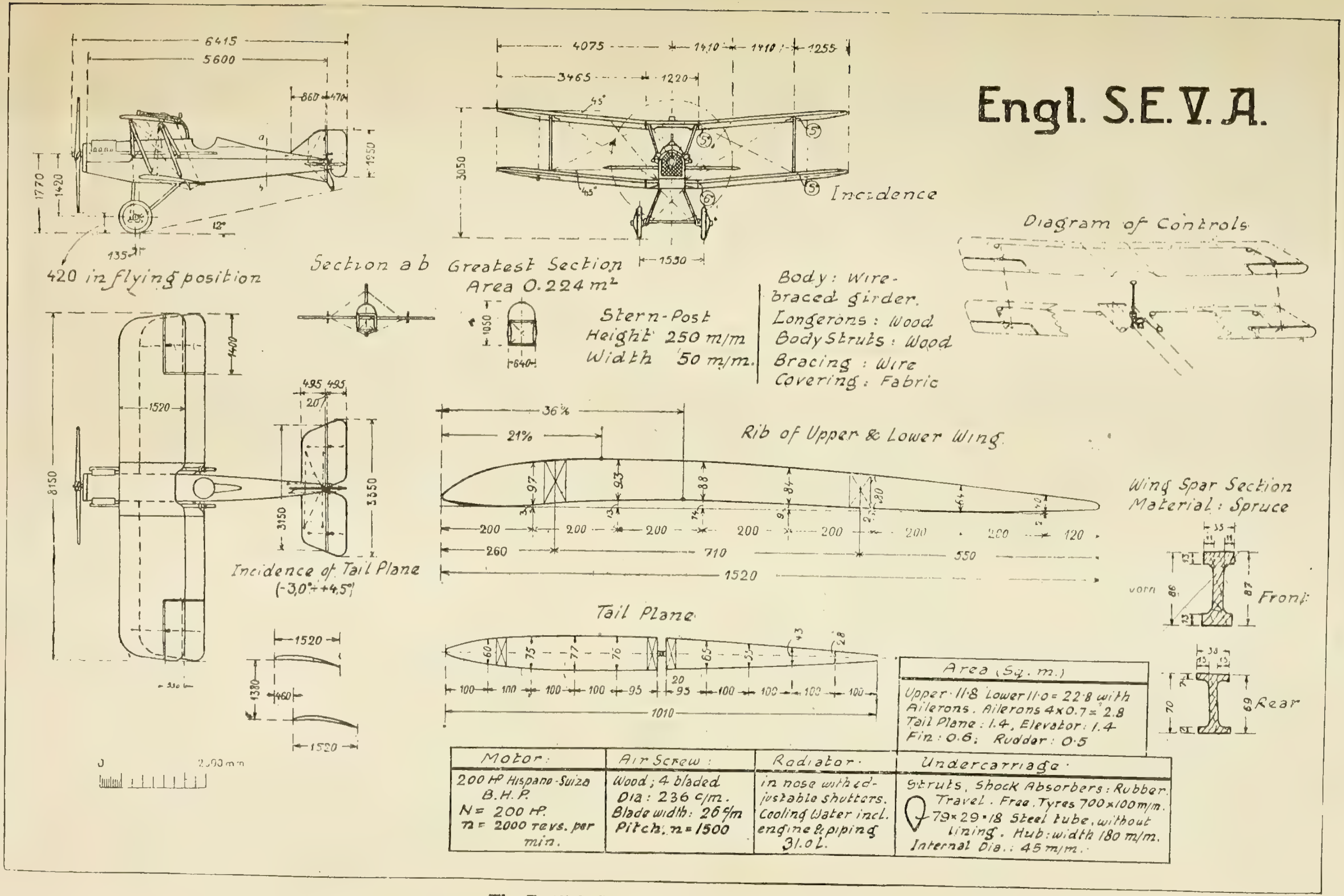
The elevator hooked to the fixed tail-plane partakes in this movement. The wires for operating the elevator are led through the body and tail-plane, which certainly saves air resistance, yet makes twice a 20 deg. direction change of each wire necessary. Main and tail-planes are equipped with cellon windows, rendering a control of the rollers possible.

The under-carriage shows the normal form. The through-running axle rests between two auxiliary ones. There is no limit of the springing range.

The tail skid shows an unusual construction, being arranged turnable behind the stern post and connected with the rudder cable by intermediance of springs.



Three-quarter rear view of the S. E.

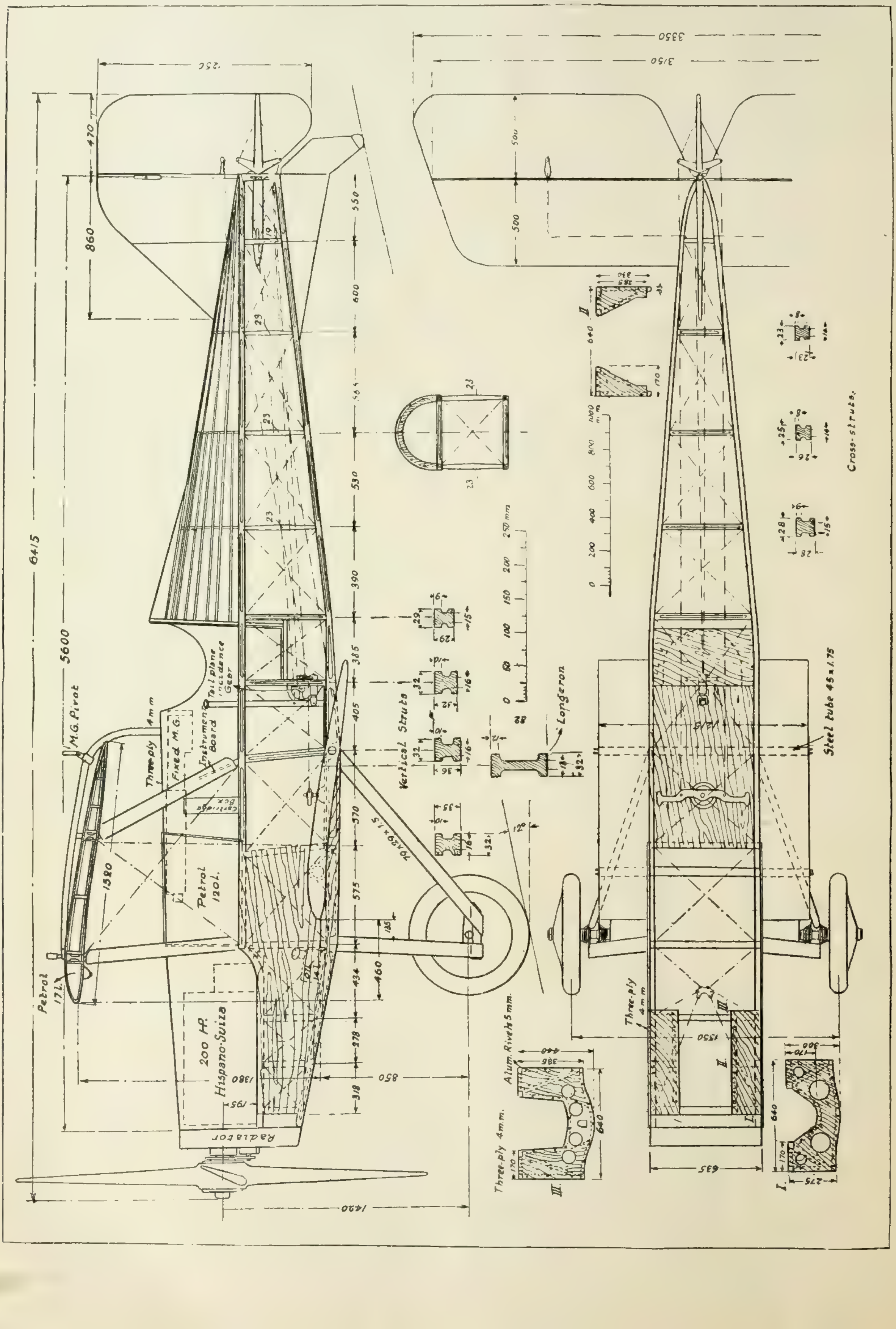


Area (Sq. m.)

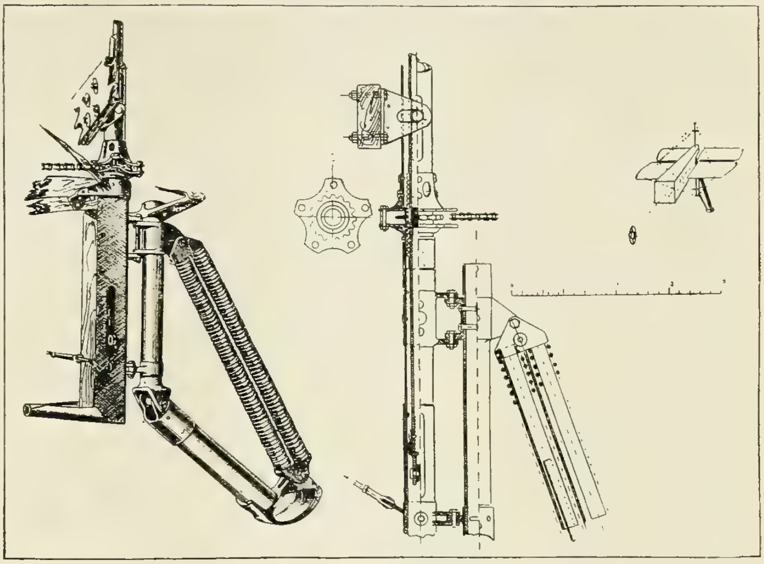
Upper 11·8 Lower 11·0 = 22·8 with Ailerons. Ailerons 4×0.7 = 2.8
Tail Plane: 1.4, Elevator: 1.4
Fin: 0.6; Rudder: 0·5

Motor:	Air Screw:	Radiator:	Undercarriage:
200 HP Hispano-Suiza B.H.P. N = 200 HP. n = 2000 revs. per min.	Wood; 4 bladed Dia: 236 c/m. Blade width: 26 c/m Pitch: n = 1500	in nose with adjustable shutters. Cooling Water incl. engine & piping 31.0 L.	Struts, Shock Absorbers: Rubber. Travel. Free. Tyres 700×100 m/m. 79×29·18 Steel tube, without lining. Hub: width 180 m/m. Internal Dia.: 45 m/m.

The English S.E.V.A. single-seater fighter.



The English S.E.V.A. single-seater fighter.



Tail plane incidence gear of the S.E.

A brass skid bow is sprung by means of two spiral pressure springs which are prevented from sideway turning by inserted telescope tubes.

According to the firm's sign board the Wolseley-Hispano-Suiza engine gave the 30th August, 1917, on brake 206 h.p. = 203 P.S. at 2005 revolutions. The r.p.m. of the four-bladed airscrew is geared down in the ratio of 4 to 3.

The exhaust gas is led behind the pilot's seat in two tubes to each side of the body. The motor sits so that there is free accessibility after removing the bonnet. The radiator forms the bow of the body.

A cover arrangement makes it possible to uncover the body about half way from the pilot's seat.

The main petrol tank of 120 litres' capacity is placed behind the motor on the upper fuselage longitudinals. A gravity tank of 17 litres capacity is arranged in the centre section between the leading edge and the main spar. The oil tank of a capacity of 14 litres lies cross in the engine frame below the rear edge of the motor.

The fuel suffices for a flight of about two hours' duration.

Following instruments are arranged in the pilot's seat:

To right: A box for the light pistols; a contact breaker for the self-starter; a contact breaker for the two magnetos; a triple led cock for the gravity and pressure petrol; a triple led cock for the hand and motor air-pump; a thermometer for the water of the radiator; the petrol gauge placed on the back side of the main tank, and a manometer for air-pressure.

To left: Gas lever; lever for regulation of the gas in altitude flights; lever for operating the radiator blinds, clip for three light cartridges. On the bottom is further arranged a hand-pump for the hydraulic machine-gun gear; two boxes for drums for the movable machine-gun and the self-starter.

A square windshield of Triplex glass is placed in front of the pilot's seat. Behind it a box is arranged in a queer position to the body with access from outside.

The fixed Vickers' machine-gun lies to left of the pilot inside the body fabric. The cartridge girdle is of metal. The firing of the machine-gun takes place hydraulically by means of a control arrangement, placed in front of the motor and connected with the machine-gun through a copper main, as well as driven from the air screw by a gear set. The firing lever sits on the stick.

On the bow-shaped iron band lying on the centre section rests a Lewis gun, which can be pulled down during the flight to permit vertical firing.

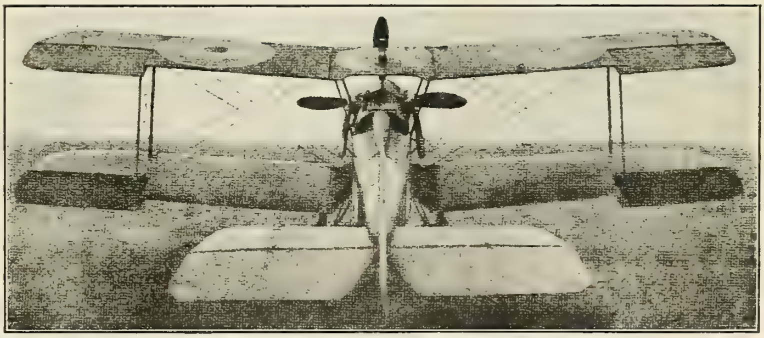
The empty weight of the aeroplane was worked out at 706 kilos, distributed as follows:

	Kilos.
Engine	225.0
Exhaust collection	12.0
Self-starter	3.6
Radiator	23.8
Radiator water	31.0
Air screw	26.6
Main petrol tank	17.8
Gravity petrol tank	6.5
Oil tank	3.9
Motor equipment	6.4
Body with seat and plate covers	151.0
Tail-plane angle of incidence change arrangement	1.9
Under carriage	40.8
Tail skid	3.7
Pilotage arrangement	5.4
Planes with wiring	112.2
Vertical and horizontal wiring	21.0
Body equipment	14.0
	706.0

The fuel weight amounts with fully loaded tanks to 111 kilos, so that the total useful load can be calculated at 250 kilos, the total weight working thus out at 956 kilos:

The load of the planes is thus: $\frac{956}{22.8}$ = 42 kilos per square metre.

The performance load is then: $\frac{956}{200}$ = 4.78 kilos per horse-power.



Rear view of the British S. E. biplane

Lieut. Fonch Credited with 49 Huns

Paris.—Lieutenant Rene Fonch is now credited officially with having brought down forty-nine German machines.

Aero Mail Service Improves

Washington.—A reduction in the delays in the aero mail service between Washington and New York, is shown in a report of the Post Office Department, issued on June 30th.

Out of twenty-four flights to New York since June 1, the mail arrived on thirteen days before 3 P. M. Nine trips were finished before 4 P. M. and only twice was the mail later than 4 P. M. in arriving.

Canadian Aero Mail Started

An aero mail service between Toronto and Montreal, Canada, was inaugurated the week commencing June 24th, when fliers from the Royal Air Force left Toronto for Montreal with about one hundred pounds of mail matter. It is expected that other routes will be started in the near future. The flying time between Toronto and Montreal will be about three hours.

Assigned to "Archies"

According to Special Order No. 143 issued at Washington the following officers are assigned to anti-aircraft batteries: Capts. J. H. Babbitt, H. F. Grimm, D. I. Piper, Lieut. G. A. Wilson and 2nd Lieuts. L. J. Buck, J. V. Collis, E. P. Jolls.

Representative La Guardia, now a Captain in the American aviation force operating in Italy, cabled Representative Siegel, of New York, that he expected to be back in Washington by the first of October.

Aeroplane for Artillery Co-operation

Camp Dix, Wrightstown, N. J.—The camp's first aeroplanes have arrived and will be put to use at once. One has been assigned to a Signal Corps company and will be equipped with wireless and used in the artillery manoeuvres.

Personal Pars

Frank A. Hayes has been promoted to the position of chief engineer of the aircraft division of Willys-Overland, Ltd., Toronto, Canada. He joined the organization last year, and prior to that was associated with the Cadillac Motor Car Co.

T. E. A. Barthel, formerly general manager of the King Motor Car Co., Detroit, has become associated with the Curtiss Aeroplane & Motor Corp., Buffalo, and his duties will have to do with the finances of the corporation.

STEEL TUBES, TUBE MANIPULATION, AND TUBULAR STRUCTURES FOR AIRCRAFT*

By W. W. HACKETT and A. G. HACKETT, of Oldbury, Birmingham

(Continued from June 24th issue)

Tubular Joints in Aircraft Construction

Generally speaking, structural work for aircraft purposes is to-day carried out by means of sockets placed in suitable positions and arranged to receive the ends of the various tubular cross-members and bracings. These tubes and sockets are connected in three or four ways—namely, by brazing, by silver-soldering, and by soft-soldering.

Sometimes the sockets or lugs are dispensed with, in which case the cross-tubes are mitred and welded direct to the main tube.

The latter method is not advisable except in very rare instances, as any operation involving great heat is dangerous, owing to the weakening which results from the annealing or perhaps burning of the steel.

Another method is sometimes employed in which the cross-bracings are connected by means of a hinge joint to a sleeve on the main tube.

It will be useful to give the results of some comparative tests made on these various methods of jointing tubular structures, but before doing so we would remark that, in a paper like this, only the fringe of the subject can be touched. Everyone who is in any way connected with the practical side of aeronautical construction will readily call to mind many other types of joints, each designed for a special purpose or to overcome a constructional difficulty.

Speaking from an experience of at least eight years, in which we have been in touch with aircraft construction and design, we have met with a surprising amount of fluctuation in the respective popularity of soldering, brazing, welding, etc., for steel tube work, all these methods having been ruled out in turn only again to find favor in certain quarters. This is partly due to the fact that machines designed by private manufacturers have been brought into great popularity and the methods and designs of such makers adopted.

We have seen welding carried almost to excess and then almost abolished. Brazing has been boomed and then decried, and soft-soldering substituted for it—with a different type of lug or joint to allow for the rescued strength of the flux. This again has been deemed unsafe, and silver-soldering, or hard-soldering, has risen into prominence, and to-day one hardly knows which type really is the popular one, as on the machines now being built for war purposes all styles and types of jointing may be found.

One has to realize that in all these methods the human element comes much into play. For instance, it is possible so to weld a joint that it appears to be sound, yet it may be a "fake"—metal being merely laid on and not fused with the surrounding parts. Or, again, the welded joint may be burnt, thus causing a dangerous weakening.

Similarly with brazing, it is possible with care to make a fine type of joint, but the probability is that in a certain percentage of cases overheating will take place and failure result.

We will now deal with the results of a few experiments recently carried out on certain of these types of joints.

Soft-Soldered Joints

Let us take soft-soldering first. In all cases the tests were made with a soft-solder composed of 60 per cent. tin and 40 per cent. lead—using "Fluxite" or some similar article as a flux.

Tubes of various gauges were tried, but up to a certain point the strength of the soldered joint was such that the tube failed in tension without the joint giving way.

The strength of a soldered joint is much greater than it is generally supposed to be, and from experiments carried out, the clearance or thickness of the soldering material does not, between the limits of .001 in. and .008 in., make much difference, but for any components that can be guaranteed to size we would recommend as "thin" a joint as possible.

A striking example of a strong joint of the type just referred to was then given. The test on this joint was carried out in order to prove to the satisfaction of inspectors that the stipulated minimum clearance of .005 in. on the diameter was not necessary. In this particular case the elevator lever was held stationary while a torsional load was exerted on the tube. The result speaks for itself.

One of the chief arguments against the use of soft solder is the reduction in strength resulting from vibration, it being claimed that this form of joint will not sustain a vibratory load nor a series of shocks. This may sometimes be right, but even under these conditions a very satisfactory result can be obtained if the sweating is done thoroughly and well, and added strength is given if the joint be "pegged."

Tests on Soldered Joints

The writer recently carried out some experiments on what may be termed a "Tup-testing machine" for soldered and brazed joints. The rising and falling tup is actuated by a bell crank lever, worked by a "sudden-drop" cam rotating in the direction of the arrow. The dead load on the tup shaft can be varied by means of the sliding weight.

A standard drop of 4 ins. was arranged for, and the method of making the test piece is shown by the enlarged section.

It was at first thought that the effect of the "tup" action would be to quickly rupture the joint, but to our great surprise the joint held to such an extent that we found it necessary during the test to increase the load from 10 lbs. to 24 lbs. The following are the details of the test:

Size of tube: 1 in. o/d. by 18-gauge.
Depth in socket (or lap): ½ in.
Thickness of solder: .005 in.
Number of blows: 113,500 with 10 lb. weight tup.

Further number of blows: 64,000 with 24-lb. weight tup.

At this stage the joint showed signs of giving way, so it was decided to apply a tensile test to see if the repeated blows had in any way deteriorated the solder. To our surprise the tube did not pull out until a load of 5.2 tons had been registered, giving the excellent result of 3.31 tons per super inch on the solder lining.

As regards the general results of soldering, the following list of tests will give a good idea of the strength attainable under proper care and supervision.

It may be urged that these results are not a fair basis on which to reckon, as they do not represent the ordinary work of the average operative. In answer, we would say that these results were all obtained from test pieces sweated by different operatives, in some cases being the work of girls with about two monthe' experience.

It may be possible to work out a formula to arrive at a basis for designers of soft-soldered joints, but even here, as in all calculations relating to structures, other factors have to be taken into account. For instance, a joint may be quite strong enough if in a 1-in. by 20-gauge tubular joint the solder reaches to a distance of ½ in., and working on this basis it follows that the same distance for a 2-in. diameter tube of the same gauge would be correct, but no one would be satisfied with this, and would naturally double the length of socket to meet the increased diameter.

Generally speaking, it may be taken for granted that with ordinary care, and with a good quality of soft solder, a joint can always be made to withstand a shearing stress of 2½ tons per super inch on the solder itself—provided (and this is the crux of the whole matter) that the articles are well tinned and cleaned prior to the operation of sweating.

As regards the apparatus for sweating, different people will have a different choice, but having tried soldering irons, blow-lamps, coal-gas jets, and hydrogen flame, we have found that the three latter are about equal, and each is better than a soldering iron alone, but this latter is necessary for finishing in awkward corners. Eventually the use of a simple electrical device will probably become popular for repetition work.

Brazing

As previously mentioned, this means of connection still has many adherents. There is, however, a great disadvantage attached to it, viz., the risk of burning the tube owing to the intense heat necessary. That this burning and consequent weakening does take place can be easily shown by the results of tests carried out by us on a cantilever testing machine.

The tests were upon tubes which had been fixed into sockets and brazed or soft-soldered.

Another point may be mentioned with regard to these tests. In one case the joint was "faked," the tube and socket being left dirty and improperly tinned in consequence of which the soldered joint had no "life." Even under these conditions the joint held for 75,130 revolutions, as against about 4,000 for the brazed joint. At this point the socket failed, due to the insecure fixing of the tube.

Another peculiar feature of this test was the heat generated in the brazed tubes due to the constant working of the molecules. The tubes commenced to warm up almost immediately, and before they broke the temperature of the tubes near to the points of fracture (*i. e.*, near the socket) was about 120 deg. C, sufficient to cause the charring of any adjacent wood, whereas the soldered tubes remained quite cool until the last few minutes prior to fracture.

We are quite aware that in many places on aircraft structures brazing is permissible and good, but where any weakening of a member is likely to cause disaster brazing should be carefully avoided.

Silver-Soldering or Hard-Soldering

The foregoing remarks as to brazing hardly apply to silver-soldering, as by this method a strong joint can be obtained without undue heat. We are not in a position at the moment to give any comparative figures of tests, but we should say that from the standpoint of tensile strength, silver-soldering is higher than soft-soldering, and very near to that of brazing. The heat necessary to perform the operation is lower than for brazing. The heat necessary to perform the operation is lower than for brazing, and is not likely to weaken any members if reasonable care is used. It is, however, a longer process, and the material used is very costly.

Welding

We may well ask ourselves in these days where we should be without some form of autogenous welding. The thousand and one articles that are built up of sheet metal welded together speak for themselves, and make us wonder how we ever got on without this useful engineering process.

Still, welding has its limits of usefulness, and if exceeded danger may be near.

In the early days of aeronautical engineering welding was often used in places and on parts where to-day it is "taboo," and such a method as welding tube to tube has dropped to a great extent out of favor, having been superseded by the more costly but beter and safer engineering practice of jointing by means of machined or built-up tubular sockets, previously referred to.

Welding—by whatever means it is done—is always open to a certain amount of doubt, and though there are innumerable cases where this doubt as to the strength of a joint is well covered for, yet, owing to the hidden nature of the defects of welding and the possiblity of burning and oxydisation, present-day designers avoid it in any important member of an aircraft structure.

A most important rule introduced during recent years has been the suitable annealing of welded joints, and this rule should be adhered to whenever possible. Many will have noticed the brittleness of a welded joint before annealing or normalizing, and the malleability of the same afterwards.

On this point the writers have discovered within the last few months a rather strange fact. We had occasion recently to make up some small lugs, from which it will be seen that a certain amount of shortening took place as the result of the welding on of the arm. We have since noticed this hortening in other tubes, some of quite considerable length, where various fittings have been welded on at intervals, and so far we have not arrived at a satisfactory explanation.

For the sake of any who may not have been able to carry out their own tests on welded joints, it may be helpful if we here give the results of some experiments we have made.

The easiest method of welding is the butt joint—*i. e.*, when two tubes are placed end to end and joined together to form one length or mitred together form one piece. In such a case the surfaces to be welded are readily accessible, and the flame has freedom for doing its work.

A more difficult type of welding is that necessary when one tube has to be mitred to the outside of another tube, as when forming a "T" lug. In this case the easily melted end of the one tube has to be united to the outside surface of the other, and anyone who has had experience with welding will know how much more difficult it is to attack the hard outside skin of a tube or sheet than it is the edge.

In order to prove this point we carried out tests on tubes measuring 1 in. outside diameter by 20-gauge and 1 in. outside diameter by 16-gauge—some being butt-welded and others having an interposed tube of about the same diameter, to which the end of each tube was welded.

Comparative tests were made on a cantilever tube joined to the main member by welding, and a similar type of loading was also tested for a lug, with the tube fixed in place by welding.

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*Paper read before the Aeronautical Society on May 2, 1918.

The following were the results:

Welded direct to tube..........	335 lbs
Welded into socket	365 "

Welding is often harshly criticised as regards its ability to withstand vibration, but even in this respect we have found striking instances where the tube has broken before the joint.

Some time ago we tried an intermittent shock and vibratory test on a machine. This machine gave a series of vibrations to the tube, the blows due to the "peg-cam" being 1,400 per minute. In some cases the tube broke off without the welded joint suffering in any appreciable manner.

As regards welding of any description to be done on tubing, we do not advocate the use of tubing made from steel too high in carbon. A low carbon steel gives the better result, and it is also most essential that the phosphorus content of both tube and welding wire shall be low.

Wherever possible we would suggest that the welding on of hinges and sockets to a main spar or post be avoided. To slot a tube or soften it by welding is unwise, and in place of any fixtures that at present demand such operations we recommend a sweated and pegged fitting.

Some experiments were carried out by our company in order to convince some of our friends of the advisability of following the course we have suggested. In one case it will be seen that a wiring lug is fixed on a main spar by welding, and in the other by sweating and pegging. Alternating tests on these tubes gave the following results:

Welded	5,190 revs.
Soldered	8,800 "

Rust Prevention

One further point remains to be mentioned. It is well known that a long life for any modern aeroplane is not expected. The present necessary wastage in aircraft is such that the question of internal rust and corrosion of the steel work is not of serious moment. The time is coming, however, when such matters will have to be seriously considered. For any post-war machines —especially if designed for general passenger traffic—the question of the length of life of all parts will be one of primary importance. Many experiments have been carried out in this country with this end in view, but nothing definite has been reached.

We have experimented with two or three methods of preserving from rust and corrosion, with fairly satisfactory results, and in the case of airship framework, subject as it is to salt-water influence, we have used with fair success the "cosletising" process.

For soldered work, such as rudder and fin frames, we have instituted at our works a thorough system of washing and brushing in hot soda water to remove all traces of the fluxite or the flux, and we think this is most essential.

In conclusion, we would say that "the last word" in tubes and tubular structures has not by any means yet been spoken. With the increase in the size of machines, the constant and ever-increasing shortage of seasoned timber, the extended use of machines in future years in hot climates, with all the climatic effects on timber, the "all-steel" machine will undoubtedly soon quently the subject of tubes and tubular construction assumes increasing importance. We all have much to learn on this subject, and we trust that this paper will prove of mutual benefit and help forward in some way the science of aeronautics and the good of the community at large.

Discussion

Captain Philpott said the subject of the paper was one of which they wanted to know a good deal. He was extremely interested in Mr. Hackett's remarks about the nickel chrome hardened tubes, which became brittle when subjected to pickling in acid. Did the authors get any explanation why that occurred? He had tried to trace the cause of that trouble and made one or two tests, and it seemed likely that the trouble was due to hydrogen getting into the steel during the pickling process. In trying to get some evidence in support of some rich proposition, a number of pieces of steel were inserted in hydrochloric acid, and afterwards the pieces of steel were boiled in water, above which gas collected which exploded when flame was applied to it. Had the authors tried to solve the question why nickel-chrome steel was rendered brittle by pickling? With regard to the double tube—one tube inside the other—which was tested, he believed it was a fatigue test—*i. e.*, the rotary volar test. It looked as though the test piece might act similarly to carriage springs, which were subjected to an alternation of stresses during their life and lasted a long time. Before feeling that that was satisfactory he would like to see how the stress was calculated. It was not easy to calculate the stress of one tube inside another when it was subjected to a bending operation. An assumption must be made of the pressures between one tube and the other. He would have felt happier in discussing the other tests if he had seen the results beforehand.

Captain Smith said Mr. Hackett suggested that the reduction of mild steel tubes was about 1½-gauge per draw, and the reduction of the nickel chrome steel about half that. The difference in gauge varied as the actual gauge thickness. Was that reduction considered as an average value, or was that taken irrespective of the gauge to be reduced? The figures of the alternating stress tests appeared to show that there was a small amount of torsional breakage. It appeared to him that there was a certain amount of torsional stress set up during the revolution of the specimen, which might be due to a certain amount of lag of the load. He thought Mr. Hackett suggested that the cold drawing hardened the outside more than the inside of the tube. In his opinion that had been well shown in connection with the cold drawing of a mild steel bar. An important point which was clearly shown was the fact of the distinction between the brazed and the soft-soldered joints. Those experiments were worth while developing, and if the results arrived at with them were true it was a big point which should be watched.

Mr. C. W. Meredith said the difficulty in using soft-soldered joints was that the outside diameter of the tube was not uniform. A lug made up from a turned forging varied up to 1/64-in. diameter. Of course, that might not apply to all manufacturers of steel tubes, but the outside diameter varied so much that it made it very difficult to soft-solder. One usually asked a man to braze a joint because one had more confidence in brazing.

Second Lieutenant Shaw said a point of interest in connection with tubes was that that more care should be given to the selection of material. While two materials might give exactly identical strength-over-weight values, one material might be denser than the other, in which case the discerning engineering would employ the denser material rather than the lighter, because it would have a smaller surface and take up less room.

Mr. G. I. Price said he was very interested in the samples of bent tubes shown. Could the authors give any information concerning the right means of determining the line that existed between the inner and outer radius of a bent tube that did not change in length during the bending process? The thickening of the inside of the bend was presumably equal to the thinning of the outside. He believed that sort of thing was generally left to the practical operators in the shops, but it seemed to him that it must be possible to determine the position of that neutral axis Was there a right method of doing so?

The chairman said the authors gave one analysis for nickel chrome steel, but did not give any details as to the care and trouble taken in altering the annealing temperatures to meet the various analysis. No details were given as to the temperatures and times in the heat treatment. The question of suitable filling for bending was mentioned. It would be very valuable, especially for aircraft constructors, to have details in regard to that, because they often attempted to bend the tubes themselves, and they did not always succeed. He asked both these questions for the benefit of the user rather than from the manufacturer's point of view. One thing that struck him very much was the ingenuity and the multiplicity of the testing machines that had been used, and the amount of "meat"—if he might use the expression—in the tests results obtained was something colossal. He knew what it meant to produce such an enormous number of figures as had been produced by the authors, who had given a large number of comparative tests of tubes, and tubes in fittings. He would like to know whether those tests were made with pieces of tube all cut up the same length or lengths of tube all made at the same time with the same analysis, and so forth. No doubt the figures were valuable, but he would like to see some of those tests correlated with analysis figures and with the usual test results that were included in the ordinary specifications. With regard to welding, he was glad such strong expressions of opinion had been put forward by the authors on that subject, as it was one of the most difficult they had to face. He always had cold feet when he had to look at a weld. Had the authors had any special difficulty in regard to welding, and what precautions did they take with alloy steels? They mentioned that low-carbon steel and straight-carbon steel was preferable. He would like to know their experience with high nickels, high chrome, low nickel, medium nickel chrome and medium carbons.

Reply

Mr. W. W. Hackett said, in reference to Captain Philpott's remarks regarding the effect of the pickling on chrome nickel tubes that had hardened, his explanation coincided with theirs (the authors). He asked everyone to avoid it. That was what they were out to warn people against.

Captain Philpott also asked, in regard to laminated tubes, how the stresses were worked out. They took the strength of two tubes 32/1,000-in. thick, which was equal to one tube of 64/1,000. They took one tube 32/1,000 thick and drew it down to another of 32/1,000 thick and tested it against a tube of 64/1,000. He thought that gave the same results as regarded its weight.

Captain Smith asked how the reduction of gauge was reckoned. They went from 10-gauge to betwen 11- and 12-gauge in the particular case mentioned. The gauges came down roughly in steps as follows:

22 gauges...............	28/1,000 thick
21 gauges...............	32/1,000 "
20 gauges...............	36/1,000 "
19 gauges...............	40/1,000 "

Then they jumped in eight:

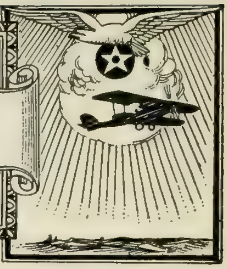
18 gauges...............	48/1,000 thick
17 gauges...............	56/1,000 "
16 gauges...............	64/1,000 "

Then they jumped to twelves and sixteens, and by that method one did not get far wrong. It was a fairly good rule to give a gauge and a half per draw to ordinary mild steel tubes, and half that to chrome nickel tubes. This might be thought to indicate that the chrome nickel tube was stronger, as it stood the pull with less reduction, but they had had a lot of trouble through trying that theory. Someone said in regard to soft-soldering there was a variation of 1/64 in the size of the tubes. There should not be. All his company was expected to allow was a plus of .004 and minus nothing. If they were to get 1/64 it would be about twelve times too much, and he would certainly complain. A question was asked about the length of tube that was going to be bent. By measuring round the neutral axis—the middle of the tube—one got practically the length taken for bending. In the illustration he gave of the bent tube he gave figures which he thought showed that it had thinned on the one side practically as much as it had thickened on the other side. By going right round the middle of the tube to find out the amount required one did not get far wrong.

Lieutenant-Colonel Bagnall-Wild asked about the annealing temperatures. For the mild steel the temperature was 650° to 750°. It was best either to go above those temperatures or keep under them in the working. The safest way, as a rule, was to keep under. They got a more uniform result before the last drawing, and if a temperature of about 850° was got by close annealing that was the temperature of the tube. The period must be according to the thickness of the tube. Take 18-gauge—about normal thickness —that was given about 25 minutes, 10-gauge 40 to 45 minutes, and 20-gauge 15 to 20 minutes. Various things were used for filling before bending. Lead was one and resin another, but resin should always be used in a fireproof building. It was one the easiest and cheapest things to bend with, but there would be trouble unless it were done in a proper building. If filling were not used a special mandrel must be made, which was very expensive. The test pieces described were on every occasion taken off the same piece of tube. They (the authors) had not set out to prove a theory, but to let the test pieces prove the case. A length of tube was cut up and the pieces to test were taken in a fair and reliable way. If anyone would like the tests carried out again it might be worth while, and they were quite willing to go on and take any test the members of the society wished them to take. With regard to the tensile testing, each batch of tubes had a number of tests carried out by means of tensile testing, flattening and crushing. The crushing tests used were some of those taken from the Aircraft Inspection Department. With the heat treatment given at their works they got not more than ½ per cent. of rejections from any causes. He thought the correlation of their tests with the tensile tests one got in the normal work was given in some of the charts. On all the charts the tensile tests and elongation were given.

Mr. A. G. Hackett said, in regard to Captain Smith's question, there was very little torsion effect on the alternating machine. When the machine was in operation the tube was practically in alignment with the machine spindle. It it were carried round by the torsion effort it would carry out of line. Sometimes it wobbled, and they had to rush to stop it. By putting the weights on too quickly and setting up vibration harm was apt to be done without proving anything. The case put forward by Mr. Harold Smith presented no difficulty. The bending of two pipes which had been shown on the screen, and which were streamline tubing 2 in. by 1 in., or probably more, gave very little difficulty when proper tools were used. They had now in hand the bending of a 6-in. by 2½-in. tube, streamlined on the flat. In ordering tubes for bends it was usual to allow a little over and cut to the right size after bending, otherwise one would not get the accuracy the A.I.D. expected. No doubt many of those present had found, as he had done, that in trying to bend annealed tubing, say 1 in., 20 or 22 gauges, it puckered. It was better to bend it in a slightly harder condition and anneal it down afterwards. It was impossible to bend it properly if it had been annealed too far. That point should be brought more in front of contractors who had to deal with tubular bends. With regard to the point raised by the chairman as to filling for bending, with a close-wound spring of suitable strength a small bend could be got, and to avoid any chance of buckling or breaking the spring could be twisted in and twisted out again, and good results could be obtained. But for anything past a certain angle it was not a practical proposition.

NAVAL and MILITARY AERONAUTICS



Key to Abbreviations

AAD—Assigned to active duty.
ADO—Report to Aviation Supply Depot, Dayton, Ohio.
ADT—Report to Aviation Supply Depot, Dallas, Texas.
AFO—Report to Aviation Supply Depot, Fairfield, O.
AGC—Report to Aviation Supply Depot, Garden City, L. I., N. Y.
AHT—Report to Aerial Gunnery School, Houston, Texas.
ALF—Report to Camp Alfred Vail, Little Silver, N. J.
AMV—Report to Aviation General Supply Depot, Morrison, Va.
AOV—Report to School for Aerial Observers, Hampton, Va.
APR—Report to School of Aerial Photography, Rochester, N. Y.
ARV—Report to Aviation Supply Depot, Richmond, Va.
ASM—Report to Aviation Mechanics' Training School, St. Paul, Minn.
BFT—Report to Barron Field, Fort Worth, Texas.
BRN—Report to Bakers Field, Rochester, N. Y.
BST—Report to Brooks Field, San Antonio, Tex.
CAF—Report to Carlstrom Field, Arcadia, Fla.
CAP—Commissioned as Captain, Aviation Section, Signal Corps.
CDT—Report to Aviation Concentration Camp, Dallas, Texas.
CFT—Report to Carruthers Field, Fort Worth, Texas.
CGC—Report to Aviation Concentration Camp, Garden City, L. I., N. Y.
CGS—Report to Aviation Concentration Camp, Greenville, S. C.
CIT—Report to Radio School, Carnegie Institute of Technology, Pittsburgh, Pa.
CJS—Report to Camp Jackson, Columbia, S. C.
CJW—Report to Camp John Wise, San Antonio, Texas.
CLR—Commissioned as Colonel, Aviation Section, Signal Reserve Corps.
CMV—Report to Aviation Concentration Camp, Morrison, Va.
CPR—Commissioned as Captain, Aviation Section, Signal Reserve Corps.
CRI—Report to Chanute Field, Rantoul, Ill.
CSO—Report to the Chief Signal Officer, Washington, D. C.
CUI—Report to School of Military Aeronautics, Cornell University, Ithaca, N. Y.
CWT—Report to Call Field, Wichita Falls, Texas
DAF—Report to Dorr Field, Arcadia, Fla.
DAP—Report to Director of Aircraft Production, Washington, D. C.
DIK—Report to Camp Dick, Dallas, Tex.
DIS—Honorably discharged from service.
DMA—Report to Director of MilitaryAeronautics, Washington, D. C.
FLA—Report to Eberts Field, Loanoke, Ark.
EOT—Report to Ellington Field, Olcott, Texas.
FLR—Commissioned as First Lieutenant, Aviation Section, Signal Reserve Corps.
FLT—Commissioned as First Lieutenant, Aviation Section, Signal Corps.
FOB—Report to Fort Omaha Balloon School, Omaha, Neb.
FRF—On duty requiring regular and frequent aerial flights.
FSO—Report to Fort Sill School for Aerial Observers, Fort Sill, Okla.
GIT—Report to School of Military Aeronautics, Georgia Institute of Technology, Augusta, Ga.
GLC—Report to Gerstner Field, Lake Charles, La.
HHN—Report to Hazelhurst Field, Mineola, L. I., N. Y.
JMA—Rated as Junior Military Aviator.
JRC—Report to Jackson Field, Riverside, Cal.
KST—Report to Kelly Field, So. San Antonio, Tex. (When specified in the order, the number of the field is given in parentheses)
LDT—Report to Love Field, Dallas, Tex.
LHV—Report to Langley Field, Dallas, Tex.
MAC—Report to March Field, Allesandro, Cal.
MAJ—Commissioned as Major, Aviation Section, Signal Corps.
MAT—Report to Mather Field, Sacramento, Cal.
MDO—Report to McCook Field, Dayton, Ohio.
MIT—Report to School of Military Aeronautics, Massachusetts Institute of Technology, Boston, Mass.
MJR—Commissioned as Major, Aviation Section, Signal Reserve Corps.
MSC—Report to Radio School, Maryland State Agricultural College, College Park, Md.
OSU—Report to School of Military Aeronautics, Ohio State University, Columbus, Ohio.
PFO—Report to Post Field, Fort Sill, Okla.
PMT—Report to Park Field, Millington, Tenn.
PUP—Report to School of Military Aeronautics, Princeton University, Princeton, N. J.
PWM—Report to Payne Field, West Point, Miss.
REL—Relieved from present duty.
RSD—Report to Rockwell Field, San Diego, Cal.
RTR—Retransferred to organization attached to previous assignment to aviation duty.
RWT—Report to Rich Field, Waco, Tex.
SBI—Report to Scott Field, Belleville, Ill.
SAG—Report to Souther Field, Americus, Ga.
SGS—Report to Camp Sevier, Greenville, S. C.
SLR—Commissioned as Second Lieutenant, Aviation Section, Signal Reserve Corps.
SLT—Commissioned as Second Lieutenant, Aviation Section, Signal Corps.
SMM—Report to Selfridge Field, Mount Clemens, Mich.
SRC—Report to Columbia School for Radio Officers, New York City.
TFT—Report to Taliaferro Field, Fort Worth, Texas. (When specified in the order, the number of the field is given in parentheses)
TMA—Report to Taylor Field, Montgomery, Ala.
UCB—Report to School of Military Aeronautics, University of California, Berkeley, Cal.
UIU—Report to School of Military Aeronautics, University of Illinois, Urbana, Ill.
UTA—Report to School of Military Aeronautics, University of Texas, Austin, Tex.
VBW—Report to Vancouver Barracks, Washington.
WAC—Report to Aviation Concentration Camp, Waco, Tex.
WCS—Wire to the Chief Signal Officer upon arrival.
WDM—Wire, Director of Military Aeronautics, upon arrival.
WFO—Report to Wilbur Wright Field, Fairfield, Ohio.

Note 1—Report to points named in order mentioned for temporary duty.

Note 2—Report to Finance Manager, Aircraft Production, 870 Woodward Bldg., Detroit, Mich.

Note 3—Report to Col. J. G. Vincent, Mutual Bldg., Dayton, Ohio.

Note 4—Report to Swissville, Pa.

Note 5—Report to District Manager of Equipment, Chicago, Ill.

Note 6—Report to Major Hall, Dayton, Ohio.

Note 7—Report to District Manager of Production, 1836 Euclid Ave., Cleveland, Ohio.

Note 8—Report to Sturtevant Aeroplane Corporation, Boston, Mass.

Note 9—Report to Capt F. C. Bahr, Springwells, Detroit, Mich.

Note 10—Report to District Manager of Equipment, Buffalo, N. Y.

Note 11—Report to War Prison Barracks, No. 2, Fort Oglethorpe, Ga.

Note 12—Report to O. i/c Production Bureau Aircraft Production, Dayton, Ohio.

Note 13—Report to Radio School, University of Texas, Austin, Texas.

Note 14—Report to Finance Dept., Packard Motor Car Co., Detroit, Mich.

Note 15—Report to Camp Alfred Vail, Little Silver, N. J.

Note 16—Report to Capt. M. H. Grace, 480 Lexington Ave., New York City.

Note 17—Report to Fort Kamehameha, Honolulu, Hawaii.

Note 18—Report to Capt. P. B. Holmes, 870 Woodward Ave., Detroit, Mich.

Note 19—Report to District Manager of Equipment, 870 Woodward Ave., Detroit, Mich.

Note 20—Report to Edgewood Arsenal, Edgewood, Md.

Note 21—Report to Cooperstown, N. Y., and wire D. M. A.

Special Orders Nos. 135 to 141, Inclusive

A

Allen, Graff	FRF
Anderson, Milton Stanton	SLR, EOT
Apelt, Carl P.	SLR; AAD
Abernathy, Claude S	DIK
Albright, John Wilson	SLR, PMT
Addington, Edward P.	LHV
Andrews, Searle Earnhart	SLR; RWT
Allen, George E.	EOT
Archer, Cecil E.	PWM
Aubuchon, Joseph M.	WFO
Ammell, Roy W.	WFO
Avera, John W.	WFO
Arnold, Leslie P.	TFT
Alexandre, James H.	SLR; DMA
Austin, Harold Russell	SLR; FOB
Allen, Morton P.	SBI
Allen, Albert A.	TFT
Ayers, Verne U.	CAF
Arnold, George M.	TFT
Arnold, Ivan Thomas	SLR; PMT
Allen, Leon Byron	SLR; Note 4
Adams, Lawrence Russell	SLR; Note 5

B

Buchanan, Thomas Shirley	SLR; PMT
Baker, Edwin D.	FRF
Brush, Oliver G.	DIK
Bartholf, John C P.	MAC
Brown, Clinton Giddings	CPR; DMA
Booker, John Marshall	SLR; MAT
Baildon, John K.	FRF
Blackburn, Lloyd C.	FRF
Bartlett, Treffley P.	FRF
Brewer, Scott R.	FRF
Barrett, Clement J.	DMA
Baldwin, Robert Caleb	CPR; DMA
Balkman, Herbert H.	FRF
Braymen, Kenneth Currie	SLR; KST
Bradley, Timothy Whitelaw	SLR; RWT
Breese, Clinton S.	SLR; DIK
Bell, Alonzo E.	EOT
Breckon, Leslie S.	PFO
Burge, Kemp S.	LHV
Biersdorf, Frederick W.	PWM
Buser, Albert E.	PFO
Barr, George D.	EOT
Bell, Charles Frank	SLR
Belt, William S.	SLR; AAD
Brainerd, Walter Melville	SLR; KST
Buckland, William Eaton	SLR; RWT
Burrows, Frank Herbert	SLR; EOT
Brackett, Roy	VBW
Bates, John H.	WFO
Brants, Harry E.	WFO
Berrien, Chauncey Leonard	SLR; DAP
Beck, Vernon S.	SLR; PMT
Baker, Robert H.	WFO
Blackmer, Lawrence M.	WFO
Bruch, Russell L.	WFO
Bailey, Louis C.	WFO
Brodrick, William J. H.	WFO
Barnes, Dwight F.	WFO
Booth, Harold W.	WFO

Burnet, Gilbert W	WFO
Backus, Charles F	FRF
Bailey, James R	WFO
Bidwell, Robinson E	WFO
Birmingham, William J	CIT
Bailey, James R	FRF
Bartlett, Charles Owen	SLR; PFO
Bishop, Albert Bentley	SLR; PFO
Blynn, Lloyd Ross	FLT; VEW
Backus, Charles F., Jr	SLR; AAD
Britton, Ralph Royal	SLR; ELA
Batty, John Hereford	SLR; AAD
Blake, Joseph F	CAF
Buell, Maurice L	CAF
Budd, Dennison M	DIK
Barrett, James R	WFO
Barnard, George A	TFT
Browning, Russell I	TFT
Blanchard, Carleton W	WFO
Blum, Clarence A	TFT
Bennett, Horace R	TFT
Bateman, George L	TFT
Biggs, Frederick P	TFT
Bramlette, James L	WFO
Barrett, Philip A	TFT
Bird, Emerson Prall	SLR; RWT
Baskerville, Ralph Edwin	SLR; CGC
Bernard, Clifford Shaffer	SLR; LDT
Brannum, Claude Joseph	SLR; RSD
Bassett, Bert Van Cickle	FLR; Note 6
Ball, Leland Herbert	SLR; Note 7
Baird, John Leith	SLR; Note 4

C

Cummings, Frank J	WFO
Clauss, Albert F	WFO
Camblin, Roy W	DIK
Churchill, George Everett	SLR; RSD
Campbell, Robert A	FLT; DIK
Campbell, Walter M	WFO
Callis, Louis Emmanuel	SLR; TFT
Carroll, Alfred B	FRF; TFT
Cainon, Cutler J	VEW
Case, Ira M	BFT
Caskey, Lorne Lane	SLR; CGC
Cattermole, Edward Lowell	SLR; CGC
Cecil, Harlan E	SLR; CGC
Chalfont, Harvey Odell	SLR; AAD
Cornell, George C	SLR; AAD
Clarke, Horace	DIK
Currie, Edward William	SLR; RWT
Cox, Charles Benjamin	CPR; DAP
Christian, Ben	SLR; RSD
Chester, Andrew E	SLR; AAD
Couberly, Lawrence B	SLR; AAD
Clark, Willard Shaw	SLR; LDT
Craig, Howard Arnold	SLR; CGC
Curran, James M	FRF
Coulton, George	SLR; CWT
Childress, Charles William, Jr	SLR; KST
Cary, Edward A	CAF
Coleman, Arthur A	PWM
Chauncey, Charles C	CAF
Chaddock, Homer L	PWM
Chance, Percival N	PWM
Cooper, Lane R	PWM
Cone, Charles L	PFO
Clark, Arthur French	SLR; RSD
Cole, Harold Lester	SLR; RSD
Collier, Henry Latimere	SLR; AAD
Collins, Claude Raymond	SLR; AAD
Compton, Howard	SLR; AAD
Colthart, Robert L	VEW
Clark, Smith D	WFO
Collins, Raymond D	WFO
Crawford, Frank H	WFO
Camaron, David	WFO
Cole, Dausa W	WFO
Caldwell, Jabin R	WFO
Cline, Harold V	WFO
Case, Kenneth B	FOB
Chapman, Harold Culver	SLR; LDT
Carter, Edward Vivian	SLR; RSD
Craig, William Walter	SLR; AAD
Chaplin, Winthrop Lancelot	SRL; LDT
Creshore, John Davenport	SLR; EOT
Cleveland, Waldo Atwood	SLR; LDT
Cathcart, Donald Guthrie	SLR; FOB
Carroll, Thomas J	KST
Cohen, John	SLR; EOT
Charroin, Arthur Buron	SLR; KST
Cunningham, Samuel Davis	SLR; RSD
Coningsby, Alfred R	CRI
Coons, Gerald F	CRI
Cox, Artie G	WFO
Craigie, Karl H	WFO
Clunk, Roy T	CRI
Cole, Charles C	TFT
Canfield, Donald Treat	SLR; PFO
Case, Leland I	TFT
Carrington, George D	SMM
Calef, Robert C	TFT
Carroll, William F	CAF
Cann, Frederick Bowman	SLR; KST
Coyle, Frank J	Note 17
Costello, John Vincent	CPR; Note 3
Caulfield, Sydney W	DAP
Cunningham, Robert Howe	FLR; Note 2

D

Daniels, Julian S	SLR; AAD
Dreyfuss, Albert M	FRF
Dixon, Thomas D	MAC
Dimond, Frank Joseph	SLR; CGC
Dorland, Chester D	JMA
Delashmutt, Harry A	DIK
Daniel, Lloyd A	DIK
Dunn, William S	VEW
Dorris, William L., Jr	DIK
Davis, John W	FRF
Doherty, Chester Cochran	SLR; KST
Dixon, Edward M	PFO
Dorian, Frank E	CAF
Davidson, Carleton Fred	SLR; PMT
Dickey, Edward K	EOT
Dyche, Justin K	PFO
Doty, David E	LHV
Duncan, John C	SLR; FRF; PMT
David, Edwin K	WFO
Daniels, William C	WFO
Doolittle, James H	WFO
Duke, John Flavel Slaughter	SLR; KST
Duke, Daniel Fitzgerald	SLR; EOT
Dewey, Robert A	WFO
Dana, Deane	WFO
Daley, Walter F	WFO
Davis, Kenneth M	WFO
Drath, Louis Herman	SLR; KST
DeLashmutt, Harry Algern	SLR; LDT
Dick-Peddie, William S	SBI
Darlington, Frank	TFT
Donalds, John E	TFT
Dvorak, Leon E	DIK
DeVore, Kenneth L	WFO
Donnelly, Clarence E	WFO
Daniell, Sidney S	FLT; DIK
Duncan, Floyd R	TFT
Dietrich, Richard H	WFO
Dallas, Burnie R	WFO
Duryea, Leslie N	TFT
Drake, Chester Myrick	SLR; LDT
Dorner, Earl Victor	SLR; KST
Dougherty, Elmer Lloyd	SLR; KST
Dayton, Paul Kuykendall	DAP
Deas, Archibald Swinton	SLR; Note 14

E

Evleth, Earl Mansfield	SLR; CWT
Ernst, George Goodman	SLR; KST
Egbert, Perry T	SLR; FRF; PMT
Eubank, Eugene L	PWM
Ethart, Earl W	DIK
Eldridge, Loyal A	DIK
Egan, Thomas Martin	SLR; ELA
Epperson, Arthur R	CAF
Erlichman, Ben B	PWM
Edson, Albert I	EOT
Eyman, Bradford	PWM
English, Connell Abdill	SLR; EOT
Evans, Floyd W	EOT
Eichelberger, Raymond R	WFO
Elliot, James H	WFO
Ebert, Solomon B	WFO
Edwards, Carl W	TFT
Elliot, Park	SLR; PFO
Emerson, Alfred G	TFT
Eldridge, Loyal Arthur	SLR; RWT
Erickson, Fridtjof Carl	SLR; RSD
Erickson, Harold	SLR; RSD
Edmonds, Percy John	SLR; Note 8

F

Fowler, William Donald	SLR; CGC
Fair, Harry C	EOT
Fields, Frank E	FRF
Frazier, Edward J	SMM
Finn, Matthew E	DIK
Fall, Harold A	SLR; AAD
Frazer, Walter	DIK
Francisco, William H	FRF
Flinn, Earle F	SLR; FRF; AAD
Frazer, Douglas Maverick	SLR; RWT
Flynn, Mortimer G	EOT; FRF
Fay, George Herbert	SLR; LDT
Foss, George A	CAF
Fidler, Charles F	EOT
Frankfort, Frederick	PFO
Fowler, Lester A	EOT
Foster, William C	LHV
Freeman, Charles M	PFO
Farrell, John Bryan	SLR; RSD
Foreman, Carroll Leonard	SLR; EOT
Fairclough, Richard H	WFO
Fulmer, Raymond L	FOB
Fritts, Ralph V	WFO
Flook, Harry E	TFT
Foster, George P., Jr	CRI
Fox, Russell R	TFT
Frierson, Samuel G	TFT
Fraser, Walter	SLR; LDT
Frink, George Willis	SLR; LDT

G

Gallup, Burton Augustus	SLR; ELA
Goodsell, Ogden Maxwell	SLR; EOT
Gilder, Rodman	DMA; SRC; WDM; Note 1
Greene, Lew A	DIK
Gile, Richard D	JMA
Gillett, Robert S	SMM
Goldthwaite, Joel A	SMM
Graham, Audrey W	SLR; AAD
Graham, Harland B	DIK
Gilman, Max Montirose	SLR; RWT
George, Marshall Woods	SLR; TFT
Goodrich, John Delos	SLR; PFO
Grazier, Oliver Earl	SLR; RSD
Gardner, Fred Eugene	SLR; CRI
Ghee, Milton Pomeroy	SLR; LDT
Graven, Carl Melvin	SLR; PMT
Garrett, John W	LHV
Gowans, John	PFO
Green, Dwight Herbert	SLR; KST
Gendron, Loen P	EOT
Gwynn, William S	SBI
Griffin, Norval B	RWT
Greve, Lyman T	KST
Grady, Henry L	SLT; DIK
Grubb, Kenneth P	WFO
Gillet, Charles B	FOB
Gilman, Harold A	WFO
Groah, Gordon L	SLR; PMT
Gomes, Russell	WFO
Gleerup, William W	WFO
Guthier, Roy E	WFO
Goddard, Fred C	WFO
Goos, Carl N	WFO
Garber, Ray O	CRI
Gowen, John K., Jr	CRI
Graham, Joseph A	TFT
Grantham, Harry N	DIK
Gilchrist, Hugh Robert	SLR; CGC

H

Hamilton, Thomas V	SMM
Hangan, Alfred J	SMM
Howard, Harlan L	SMM
Hirsh, Moriss W	SMM
Hoffman, Raymond L	SMM
Hines, Charles G	SLR; DAP
Hatherman, John Francis	SLR; DAP
Haddorff, Carl Loepold	SLR; RWT
Hayward, Griswold S	SRC
Heffner, Roy J	DMA
Herslof, Sigurd N	SLR; FRF; PMT
Hayes, Leslie E	SLR; AAD
Harbage, Homer B	DIK
Healy, Michael V	DIK

Transporting partially disabled machines to the rear of the front lines for repairs (French Official Photo)

Henderson, Charles I.	SLR; AAD
Hart, Jabez W.	DIK
Holloman, Barrett W.	DIK
Hartman, Clarence A.	DIK
Hall, George L.	DIK
Haines, Frank B.	SLR; AAD
Huber, Gilbert Jacob	SLR; CRI
Hajek, William Jennings	SLR; RSD
Heaney, John William	FLR; VBW
Harrison, George R.	OSU
Haggerty, Stewart A.	FRF
Hawkins, Emin W.	SLR; FRF; AAD
Hill, John Parker	FLT; DIK
Howard, Thomas D.	FLR; DIK
Hassan, Ali A., Jr.	CAF
Hughes, Albert E.	SLR; AAD
Harvey, Harold M.	LHV
Heyden, Arthur L.	EOT
Henry, Percy C., Jr.	PWM
Harding, Roy E.	PFO
Haywood, Oliver C.	FRF; PFO
Hyde, Gordon E.	PFO
Houlihan, Daniel J.	PWM
Hillix, Albert F.	LHV
Hanley, Harold R.	EOT
Hale, January R.	DIK
Houlton, Raymond Colliver	SLR; EOT
Hughes, Edwin Donald	SLR; CWT
Harvey, Robert Baker	SLR; AAD
Haynes, Grissom Edward	SLR; EOT
Haywood, Chester Benson	SLR; RWT
Hebbard, Charles Bradford	SLR; RSD
Hooper, Harley Lewis	SLR; RSD
Hitchcock, William Charles	SLR; AAD
Henderson, Paul R.	FRF
Hayden, Max Ernest	SLR; ELA
Hall, Edwin Philip	SLR; RWT
Harris, Richard F.	DMA
Hodgin, Barney R.	VEW
Huffman, Charles Ray	SLR; PFO
Hunt, Barton Lee	SLR; PFO
Haines, Charles Henry	SLR; HHN
Hartman, Frederick S.	WFO
Holmes, Robert B.	WFO
Haddon, Julian B.	TFT
Hughes, Francis F.	TFT
Haggerty, Lyman H.	SLR; AAD
Henderson, Warren	CAF
Hart, John F.	WFO
Hager, Daniel I.	WFO
Howard, Raymond E.	DIK
Hirshfield, Ira W.	WFO
Hughes, Joseph V.	WFO
Heltzen, Harold H.	SBI
Hoffman, Ernest E.	SBI
Hanson, Bert J.	SLR; CGC
Hinds, Harold W.	CAF
Hyde, Jules Verne	SLR; LDT
Hale, January Rowland	SLR; KST
Hungerford, Clarence Ives	SLR; KST
Headley, Mervin Eugene	SLR; EOT
Hartshorne, Frank W. K.	TFT
Hill, Edward A.	TFT
Hegenberger, Albert F.	TFT
Howard, Lynn Frederick	SLR; HHN
Howard, Raymond Edward	SLR; HHN
Henning, William Hugh	SLR; Note 4
Highbie, Carlton Milo	SLR; Note 9
Hubbard, Charles Wells	SLR; Note 10

I

Imhoff, Wallace Garretson	SLR; RWT
Innes, William Wallace	SLR; CWT
Ittner, Harold Darlington	SLR; AAD
Ingraham, Elmer C.	SLR; AAD
Isbill, Paul M.	WFO
Isom, Walter Lee	SLR; RSD

J

Jones, Vivian M.	DIK
Jenkins, Ned W.	SLR; AAD
Jewett, Alfred L. M.	DIK
Johnston, Neil S.	PWM
Johnson, Everett B.	PFO
Johnson, Andrew B., Jr.	CAF
Jewett, Harold A.	CAF
Johnson, George S.	PWM
Jones, Ira Milton	SLR; CRI
Junkins, Albert Benton	SLR; PFO
Johnson, Laurence Strean	SLR; TFT
Justice, Philip S.	DIK
Johnson, Frank A., Jr.	TFT
Jackson, Norris D.	TFT
Jones, James S.	WFO
Johnstone, Hugh R.	WFO
Jordan, James J.	WFO
Johnson, Courtlandt S.	WFO
Johnson, Bruce	WFO
Jones, Elmer H.	WFO
Jewett, Alfred Liljevalch	SLR; LDT
Jones, Howard Hiltz	SLR; LDT
Jonson, John Marvin	REL
Jenninson, John Charles	SLR; LDT
Johnston, Waldo C.	Note 21
Jenkins, Nelson D.	Note 17
Jones, Raymond W.	Note 11

K

Kenny, Franklin R.	DMA
Klingensmith, Ward Clifton	SLR; PMT
Killough, Hugh B.	TFT; LFV; Note 1
Keniston, Harry Cole	SLR; RWT
Kuhlman, Roy A.	FRF
Kalkman, Eugene C.	SMM
Kolb, William M.	SMM
Klinger, Kenneth P.	SMM
Kenney, Cornelius J.	DIK
Kennedy, Walter Clay	SLR; RSD
Kelley, Virgil A.	FRF
Keig, Alfred J.	SLR; AAD
Keith, Arthur Morson	SLR; KST
Kerih, Anthony John	SLR; PFO
Kenney, Irven W.	VBW
Kiener, Harry	SLR; RWT
Kohr, Hugo John	SLR; RWT
Kirby, Samuel D.	FRF
Knickel, Walter Clayton	SLR; ELA
Kirkpatrick, Richard J.	CAF
Kloke, Carl Pattee	SLR; EOT
Kiley, James E.	TFT
Keeley, James H., Jr.	WFO
Kilburn, George W.	WFO
Kroche, Frederick E.	WFO
Kavanaugh, Claude	TFT
Kenny, Raymond	WFO
Keys, Arthur A.	WFO
Kelly, William Harold	SLR; AAD
Kearney, John Joseph	SLR; KST
Kechane, John Michael	SLR; CGC
Kinney, Charles Lafayette, Jr.	SLR; CGC
Kidder, Charles D.	Note 12
Kahl, Charles A.	Note 13

L

Laughinghouse, Newman Raiford	SLR; RSD
Linn, Howard	CPR; DMA
Lloyd, William Folwell	FLR; DAP
Leeth, Herman Boscom	SLR; CWT
Littlefield, Robert C.	FRF
Lyman, Richard S.	DIK
Lundeen, Arthur	EOT
Lenihan, Edward Francis	CPR
Lea, Royal B.	LHV
Lawson, Oliver M.	EOT
Lesley, Hubert	PWM
Lungren, Edgar E.	SLR; AAD
Lawson, Harry E.	DIK
Lobdell, Warren L.	DIK
Lick, Walter E.	EOT
Lister, Harold R.	DIK
Lowe, Robert Elmer	SLR; PFO
Locher, Edward Orrick	SLR; LDT
Logan, William Lindsey	SLR; ELA
Leib, William Frederick	SLR; KST
Lenoir, Whitman Hill	SLR; PMT
Lund, Paul S.	SLR; AAD
Leonard, Charles M.	CRI
Lyle, Samuel P.	WFO
Lyon, James L.	DIK
Leger, John C.	WFO
Leighninger, Robert E. H.	WFO
Law, Hugo B.	TFT
Lawyer, Samuel E.	WFO
Lamb, Howard Earle	SLR; LDT
Lawton, Merritt Lynn	SLR; RSD

M

Mooney, Herbert R.	SMM
Mohan, Roy J.	SLR; AAD
Morrow, William Henry	FLT; VBW
Morris, Charles Galloway	SLR; KST
Maurice, Walter Ballard	FLR; CMV
Mitchell, John P.	GLC; TFT; Note 1
Mahon, William L'Estrange	SLR; ELA
Miller, Wyman R.	DIK
Morgenthaler, Daniel Carney	SLR; CGC
Mayne, Lester David	SLR; EOT
Moreton, Frederick Albert	SLR; RWT
Morton, Dudley S.	DMA
Munchhof, Theodore J.	PWM
Morris, John E.	DIK
Martin, William Hope	SLR; CGC
Miller, Charles E.	SLR; AAD
Maloney, Arthur M.	EOT
Mitchell, Donald H.	LHV
Milvard, Raymond C.	DIK
Mansell, Isaac E.	EOT
Murphy, Harry C.	PFO
Metzger, Carlisle L.	PFO
Miller, George W.	SLR; DIK
Muhlenberg, Henry C. K.	JMA
Mallory, Louis C.	DIK
Mizer, Walter Ritter	SLR; PFO
Miller, Harry Bader	SLR; RSD
Mallory, Louie Clifford	SLR; RWT
Meyer, Raymond Francis	SLR; EOT
Miller, William Francis	SLR; RWT
Mitchell, Eliot Whitney	SLR
Mitchell, William Robert	SLR; AAD
Morris, John Edward	SLR
Mayo, Francis P.	DIK
Marsh, George T.	KST
Moch, Alfred R.	KST
May, Harry P.	KST
Maharsen, Leon	SBI
Madden, John H.	WFO
Muller, August F., Jr.	WFO
Metcalf, Manton B., Jr.	WFO
Moser, Harry V.	WFO
Mahnken, Walter R.	VBW
Mader, Luther P.	TFT
Maurer, William R.	TFT
Martin, Burbon Almer	SLR; KST
Morrow, Dudley A.	SLR; CGC
Moss, Malcolm Wilbur	SLR; CGC
Mullaney, John Francis	SLR; CGC
Masters, Harry B.	DIK
Miller, Julian F.	WFO
Morris, Joseph Theodore	SLR; PFO
Morris, John P.	WFO
Miller, Edward A.	WFO
Maloney, John P.	WFO
Mapes, Donald D.	TFT
Milburn, George J.	WFO
Maxim, George W.	WFO
Moore, David H.	WFO
Moran, George S.	TFT
Morley, John Edward	CPR; VBW
Malik, Louis	SLR; RWT
Mills, Byron H.	UTA; EOT; GLC; DMA; Note 1
Moffett, Paul R.	CPR; Note 19
Mitchell, Philip Charles	SLR; Note 4
Manning, Edwin C.	FLR; Note 20

Mc

McAleenan, Arthur, Jr.	FRF
McClanahan, Marion R.	DAP
McNeil, Guy Lewis	SLR; RWT
McDonald, Samuel Floyd	SLR; TFT
McClory, Harry Garrard	SLR; ELA
McCabe, Alfred Stuart	SLR; PMT
McDonald, George C.	PWM
McAndrew, Alexander	FLR
McMillan, Neil T.	SLR; AAD
McVicker, John B.	PFO
McDonough, Edward Frank	SLR; CGC
McConky, Fred W., Jr.	SMM
McAuliffe, William F.	PWM
McCartney, Harold Graft	SLR
McGoldrick, Francis M.	CAF
McLaughlin, John G.	WFO
McGowan, Kenneth A.	TFT
McEven, Robert R.	TFT
McFlin, Bertrand James	SLR; EOT
McKnight, Harold M.	Note 17
McDowell, Robert N.	Note 17
McGeehan, Junior J.	Note 19

French "Avion de Bombardment," with two heavy guns mounted forward.
(French Official Photo)

N

Neff, Lambert G.	FRF
Nutting, Floyd Nester	SLR; MAT
Nordin, Oscar William Emanuel	SLR:PMT
Neely, Eugene Austin	SLR; PMT
Neubauer, George R.	LHV
Nagle, Clarence D.	EOT
Nelson, Luther	PFO
Naugle, Frank S.	PFO
Norris, William R.	SLR; DIK
Nelson, Erik Henning	SLR; EOT
Newbold, Edwin E.	CAF
Nolan, Charles L.	WFO
Newcomb, Walter D.	FOB

O

Owen, Ross George	SLR; LOT
O'Hare, Thomas K.	PFO
Olsen, Charles W.	CAF
O'Brien, Robert E.	DMA
O'Brien, John Joseph	FLR; CMV
Olds, Carlton T.	FOB
O'Neil, Joseph H.	WFO
O'Neil, James J.	TFT
Otstot, Robert Edward	SLR; PFO
O'Connell, Francis A.	KST
Ohrstrom, George L.	TFT
O'Brien, Maurice F.	TFT
Overmire, Wilfred Jay	SLR; CGC

P

Pollard, Thomas Glover	SLR; KST
Pidgeon, Phillip J.	SLR; AAD
Pritchard, Chester Earl	SLR; RWT
Perry, William Radcliffe	SLR; DAP
Page, Alexander M.	FLR
Pierce, Hugh M.	SAG
Potter, Duncan McKay	EUT; SLR
Paine, Grosvener Robert	SLR; KST

The first photograph of a complete Gotha "Grossflugzeug," which, it is believed, has been published in this country. (Courtesy of "Flight")

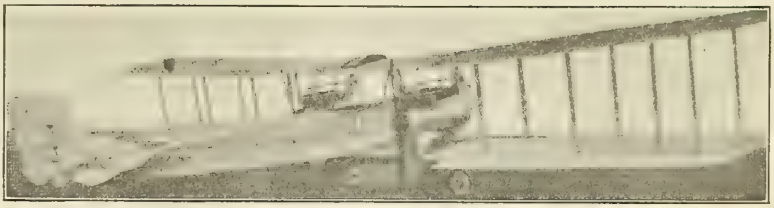
Perkins, George C.	CAF
Pilatsky, Louis	PWM
Patton, Hilton M.	SMM
Pyle, Carl W.	EOT
Pringle, Robert W.	PFO
Pennington, Jerome E.	PWM
Pearson, Lawrence H.	DIK
Penland, Clifford H.	SMM
Prindle, William D.	SMM
Pedler, Harry W.	PWM
Politoski, Edward J.	EOT
Peabody, Howard B.	SBI
Phillips, Lyman, Lumsden	KST; SLR
Pilcher, Rufus J.	WFO
Patterson, Kenneth H.	FOB
Phillips, Charles A.	DIK
Porter, Louis Hamblen	EOT; SLR
Penix, William R.	VBW
Pardy, George W.	WFO
Payne, Walter T.	DIK
Post, Leo F.	MAT
Pemberton, George Herbert	SLR: RWT
Pickup, Christopher V.	FRF
Poulin, John A.	TFT
Perkins, Edward Everett	SLR; PFO
Pyke, Charles L.	TFT
Pearson, Frederick H.	KST
Powell, Edward M.	TFT
Porter, Victor W.	DIK
Pefferle, Leslie George	SLR; CGC
Paige, William J.	WFO
Page, Henry Langford	SLR; LDT
Porter, Oscar Stanley	SLR· KST
Porter, George Harvey	SLR; Note 18
Purdy, Lewis John	FLR; Note 18

Q

Quinlan, Charles Gordon	SLR; RWT
Quick, Franklin P.	FOB

R

Russ, Chester Arthur	SLR; RSD
Rogers, Bruce Allison	SLR; RWT
Roberts, Alton True	FLR; VBW
Ryan, John W.	DIK
Rentfrow, Frank Magnus	SLR; ELA
Rollins, Joseph R.	EOT
Riggs, Robert M.	FRF
Reynolds, Walter S.	PWM
Russell, Ralph C.	DIK
Roberts, Joseph B., Jr.	EOT
Rogers, Henry S.	DIK
Rettig, Wilfred A.	CAF



Three-quarter view of the Gotha "Grossflugzeug." (Courtesy of "Flight")

Ready, James B.	PFO
Rose, Waldo H.	DIK
Reynolds, Lee F.	DIK
Rixey, James B.	CAF
Redin, Roy W.	FRF
Raeder, Elmer W.	FOB
Rauh, Joseph A.	WFO
Reynolds, Nelson Elmer	SLR; CWT
Rose, Gamaliel Sanford	SLR; DAP
Robbins, Lee R.	WFO
Rothfeld, Lawrence	WFO
Rudolph, Jacob H.	CAF
Reed, Joseph L.	KST
Reimann, Benjamin C.	KST
Ryan, Thomas J.	KST
Rolfsen, Einer Louis	SLR; CRI
Reese, Llewellyn John	SLR; EOT
Ryan, John Newman	SLR; HHN
Ryniker, Milton Edwin	SLR; ELA
Reichardt, Chris	FLT; DIK
Rozier, Thomas C.	SLT; DIK
Riggs, Robert M.	TFT
Reed, Paul Spencer	WFO
Reed, Harvey S.	TFT
Rubel, James L.	TFT
Rhine, Mel	DIK
Rossiter, Ednor M.	SLR: RSD
Regan, Harold John	SLR; AAD
Ruggles, Wesley H.	CSO
Russell, Ralph Cagwin	SLR; KST
Reynolds, Leo Francis	SLR; LDT
Rose, Waldo Hussey	SLR: RWT
Ruggles, Wesley Heinsch	SLR
Ruckstell, Glover Edwin	FLR

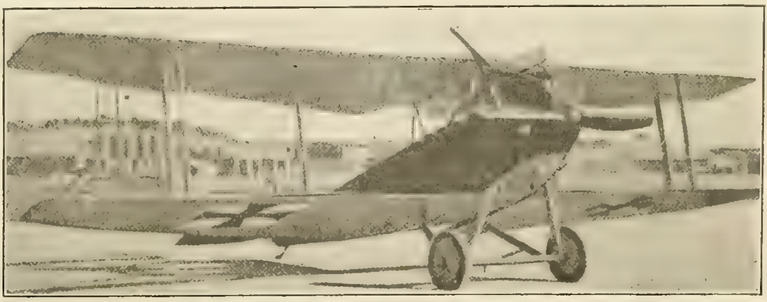
S

Schaf, Joseph C., Jr.	SRC
Simons, Seymour B.	DMA
Senft, Walter Melvin	SLR; RWT
Steedman, Charles R.	DIK
Sypher, George B.	VBW
Stabler, Russel	DIS
Simpson, John Lewis	SLR; EOT
Slater, Joseph M.	DIS
Swanson, Leonard F.	DIK
Siedle, Raymond A.	SLR; DIK
Stodder, John D.	DIK
Safford, Loyal R.	DIK
Stetson, Philip Cushing	SLR; CRI
Stanton, Charles I.	FRF
Stout, Samuel Clarence	SLR; KST
Stephens, Russell S.	FRF
Snyder, Jonathan L.	PFO
Schuler, George F.	DIK
Schustedt, Frederick N.	EDT
Sinclair, William C.	DIK
Sewards, Douglas C.	SMM
Stewart, Robert H.	FLT; DIK
Stuart, Byron D.	VBW
Schumacher, Clyde J.	PWM
Skagerberg, Rutscher	PWM
Spiner, Louis H.	PWM
Smith, George M.	LHV
Shope, Rushmore	SLR; MAT
Steinhauser, Harry H.	SLR; PFO
Suthers, William Glenn	SLR; ELA
Slattery, Patrick Joseph	SLR; LOT
Smith, Harold A.	FRF
Setzler, Harry George	SLR; PMT
Sheehy, John Frederick	SLR: RST
Sullivan, James L.	WFO
Strong, Foster G.	WFO
Scheetz, Jack F.	WFO
Shaffer, Harvey W.	WFO
Snyder, Floyd	WFO
Stoops, Robert C.	WFO
Scherzer, Ralph Julian	RSD; SLR
Sloniger, Eyir L.	FRF
Shannon, Arthur J.	FRF
Smiley, James H.	WFO
Schlipf, Albert C.	WFO
Stone, Alonzo E.	FOB
Spalsburg, Donald C.	FOB
Schmocker, Fred C.	WFO
Sampter, Herbert C.	WFO
Shepherd, Floyd W.	WFO
Smith, Walter S.	WFO
Stoll, Henry H.	KST
Stark, Lloyd R.	KST
Steuffer, Samuel M.	KST
Stafford, Louis Harold	SLR; KST
Simmons, William W.	CAF
Southwick, Philip O.	VBW
Safford, Loyal Robinson	SLR; HHN
Speed, William G.	WDM
Slocum, Paul F.	FRF
Sloan, Harry	DIK
Stalker, Willard Clem	SLR; PMT
Stollenwerck, Edward C.	SMM
Smith, William D.	CAF
Scanlan, Lawrence F.	TFT
Shepherd, Herber R.	SLR: AAD
Spainhour, Carl M.	DIK
Selff, Robert E.	WFO
Smith, Thomas J.	WFO
Seaver, Lloyd B.	DIK
Spier, James E.	SLR; AAD
Stewart, Kenneth M.	WFO
Shaffer, James H.	CRI
Starkweather, Ralph	DIK
Schaefer, Edgar F.	WFO
Silberman, Mac W.	WFO
Steele, Cyril H.	WFO
Stout, Miner W.	DIK
Steedman, Charles Richard	SLR; KST
Swanson, Leonard Frederick	SLR; KST
Shay, Carleton Carlisle	SLR; RSD
Stegall, J. Rex	SLR; LDT
Scott, Neal J.	SLR; RSD
Solomon, Winfield S.	Note 15

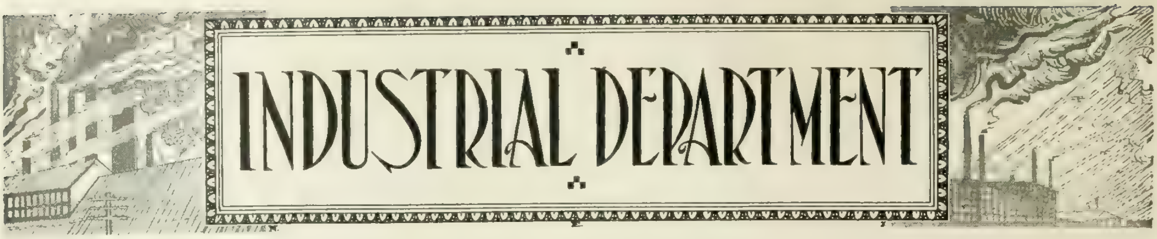
T

Talbot, Clarence P.	FRF: SLR

(*Continued on page* 840)



Front view of the A. G. O. Biplane, with its curious tapering wings, and the single inner interplane strut to the spar, with two struts to the outer bay. (Courtesy of "Flight")



INDUSTRIAL DEPARTMENT

INDIANAPOLIS IN THE AIR WAR

By ERNEST N. SMITH, General Secretary, Indianapolis Chamber of Commerce

AFTER the great drive through the air has become a matter of history and will have ended, once and for all, the menace of Prussian militarism, Indianapolis will recall with satisfaction that it was vitally and materially interested in the preparations which made possible the overwhelming bolt through the blue ether. From the Hoosier capital will have gone forth Liberty motors, propellers, crank shafts, spark plugs and many other intricate parts of the machines which will have made a "peace with victory" a glorious reality.

From an industrial and geographical standpoint, Indianapolis is ideally situated for the rapid construction of aeroplanes and aeroplane parts. The truth of this assertion has been effectively demonstrated by two facts. First, the United States Government has constructed here an aviation repair station and warehouse, where every aeroplane damaged north of the Ohio River and east of the Mississippi, is being despatched for repairs and overhauling. Secondly, many manufactories in the city have been awarded contracts by the Government for the construction of aeroplane parts running into millions of dollars.

It is no secret that one Indianapolis concern has a Government contract to turn out thousands of Liberty aeroplane motors; that another factory is forging crank shafts day and night, and that another is providing the air service with propellers in huge quantities. Sub-contracts for various parts of the aeroplane fuselage are also keeping other factories humming overtime. The war contract bureau of the Indianapolis Chamber of Commerce, through its special representatives in Washington and elsewhere, is constantly placing local industries in touch with aeroplane contract work.

Future Aeroplane Center

Men conversant with aeroplane building in the United States are certain that Indianapolis is destined to become one of the centers of this industry in the near future. It is pointed out that the raw materials necessary for the quick construction of air machines are nearer to Indianapolis than to any large industrial center in the United States. There is a readily available supply of timber and other raw materials, which can be bought cheaper in Indianapolis than elsewhere, because of her central location and excellent transportation facilities. There is no part in an aeroplane which could not be quickly manufactured in this city.

Skilled Labor

Manufactures in Indianapolis are so diversified as to provide an attractive skilled labor market. The permanency and the character of the working class is indicated by the fact that more working men own their own homes in Indianapolis than in any other American city of its class. No one industry dominates Indianapolis, and the slowing down of business in one or two lines does not affect Industrial Indianapolis. Industrial peace is less disturbed here than in any other large factory center in the United States. The open shop policy prevails, guaranteeing fewer chances for dispute between the employer and employe, and in no other city has labor seemed so satisfied as a whole.

Indianapolis is the third city in the United States in the manufacture of automobiles. Just one city—Detroit—places more complete horseless vehicles on the market. Approximately 7,000 men are employed in the following seven large auto factories: Nordyke & Marmon, National Motor Car & Vehicle Corporation, Premier Motor Corporation, Stutz Motor Car Company, Cole Motor Car Company, Empire Automobile Company and Ford Motor Company. Some of these concerns are already turning out aeroplane parts. The rest could easily adapt themselves to the manufacture of heavier-than-air machines.

Veneer Center

Because of its big furniture factories—it being one of the leading veneer and hardwood furniture manufacturing centers in the world, second in rank only to Grand Rapids—Indianapolis could readily turn out all the necessary parts for aeroplane fuselage. One or two are already manufacturing propellers. No less than twelve mills in the city are engaged in the manufacture of veneer. Giant oaks from the north, massive mahogany trees from the Amazon and gnarled ebony woods from Nigeria and Madagascar alike are pushed past the whirring saws and slicers to be cut into pieces as thin as one thirty-second of an inch, and glued on the surfaces of furniture, giving them a polish not obtainable even if solid wood were used.

Aeroplane Repair Station

Although the Government aviation repair station and warehouse will be shortly equipped with enough machinery and aeroplane parts to handle a huge amount of assembling and repair work right on the grounds, the plant is also prepared to call on the factories of Indianapolis during rush periods. The city has an exceptionally large number of iron casting foundries and one electric steel casting foundry, together with a variety of factories that are fitted to undertake the manufacture of the delicate parts of the aeroplane motor and fuselage.

The main facts about the aviation repair station and warehouse are as follows:

Site covers 20 acres.

Two main repair buildings capable of repairing all the aeroplanes damaged north of the Ohio and east of the Mississippi.

Four barracks housing 700 enlisted men, bachelor quarters and houses for married officers, dining hall, commissary, steam heating plant, Y. M. C. A. hut and other buildings.

One hundred civilians, all of them skilled mechanics.

The value of the construction work so far on the plant is in excess of $700,000.

The aviation repair station and warehouse is situated southwest of the Indianapolis Speedway, which in itself offers exceptional facilities for the trying out and tuning up of aeroplanes. The Speedway, one of the best and smoothest brick motor racing courses in the world, is used as a stopping station by flyers en route from Dayton, Ohio, to Rantoul, Illinois.

Shipping Facilities

Indianapolis has seventeen lines of steam railroad and thirteen interurban lines running in every direction. Competitive transportation lines mean better service. A belt railroad circles the city, avoiding congestion, as through freight does not enter the city. Practically every important trunk line of railroad crossing the continent passes through or near Indianapolis, and, in addition, this city is the largest interurban center in the world. The Indianapolis manufacturer has the quickest and most direct access to his national market—wherever it may be.

Markets

Indianapolis is within fifty miles of the center of population of the United States, and 76 per cent of the entire population is within twenty-four hours' ride from the city. Indianapolis is the geographical center of the territory stretching from Maine to Colorado, embracing 92½ per cent of the nation's total population. Indiana itself is a market of no mean proportions and is the very center of the great group of States which form the consuming section of the United States. The reach of Indianapolis is not cut off in any direction by lake or sea, and the manufacturer may ship his goods to all points of the compass with a minimum haul. And parallel rail and interurban lines prevent delays in case one road or line is temporarily out of the running.

(*Continued on page* 838)

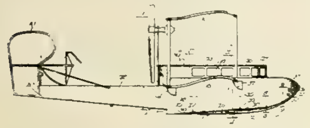
RECENT AERO PATENTS

BY WILLIAM N. MOORE

1,263,846. FLYING-BOAT. THOMAS P. BROOKE, Chicago, Ill., assignor to The Brooke Aircraft Company, a Corporation of Delaware. Filed May 17, 1916. Serial No. 97,991. (Cl. 244—2.)

1. A machine of the character described, embodying a body having a cabin therein, a roof therefor, the forward portion of the cabin and roof being shaped into freely separable sections, the rear portion of the roof of the passenger cabin being also sectional and adapted to be freely opened.

3. A machine of the character described, embodying a body comprising a housing, the bottom thereof being shaped to form steps spaced longitudinally of the body and also spaced from the forward end thereof, and provision for forcing air currents through the upright portions of the steps, the portion of the bottom between the steps and also at the extreme top of the prow for a short distance being flat, and the portion of the bottom between the said portions forming a straight line from the keel laterally to the edges of the body and diverging laterally from a medial line, at inclined angles and gradually merging into said flat portion, at the prow.



6. A machine of the character described embodying a body comprising a housing, the bottom thereof being shaped to form spaced flat portions extending longitudinally of the bottom, one of said portions being located at the front of the body and extending but a short distance and the other flat portion being located midway of the body, the portion of the bottom between said flat portions forming a straight line from the keel laterally to the edges of the body and diverging laterally at inclined angles from a medial line, one extremity of said inclined portion gradually merging into the adjacent flat portion at the front of the bottom, the other extremity of the inclined portion forming an abrupt V shape, the portion of the body in rear of the flat portion which is located midway of the body, forming a flat step and inclining upwardly in rear of the step and toward the stern, the forward end of said bottom being also shaped into an upwardly extending angle.

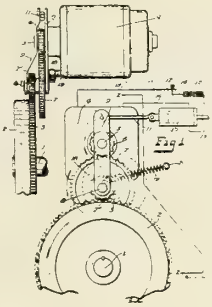
8. A machine of the character described, embodying a body, a propeller, a motor for actuating the propeller, said motor housed within the said body, and provisions whereby the operation of the propeller will induce a circulation of outside air across the motor cylinder for cooling the motor, the said provisions embodying a casing arranged around and spaced from the motor cylinder, said casing having open ends, and flanges arranged between the cylinder and casing and extending lengthwise thereof.

10. A machine of the character described, embodying a body having a compartment therein, a motor arranged in the compartment and entirely housed thereby, a propeller, and provisions whereby the operation of the propeller will cause outside air to circulate into the compartment, across the motor cylinder and out of the compartment, said motor being arranged on a vertical axis and embodying a plurality of superposed cylinders.

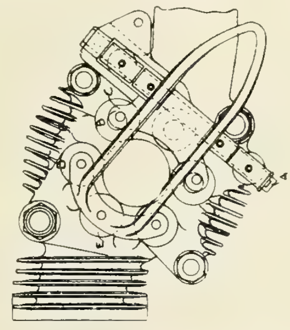
1,262,666. STARTING DEVICE FOR INTERNAL-COMBUSTION ENGINES. JOHN O. HEINZE, Springfield, Ohio, assignor to The John O. Heinze Company, Springfield, Ohio, a Corporation of Ohio. Filed March 1, 1916. Serial No. 81,397. (Cl. 74—7.)

1. In an apparatus of the character described, the combination, with the crank shaft of an internal combustion engine, of a gear operatively connected therewith, an electric motor, a gear arranged to be driven thereby, a pinion arranged to tilt about the axis of said motor gear and in operative relation therewith, together with means for throwing said pinion in mesh with said engine gear, a stop for said pinion, the direction of rotation of said pinion being such as to tend to hold it in mesh with said engine gear and against said stop.

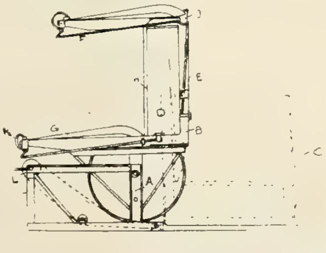
3. In an apparatus of the character described, the combination with a crank shaft of an internal combustion engine, of a gear operatively connected therewith, an electric motor and its shaft, and a pinion tiltable about the axis of said shaft and operatively connected therewith together with means for tilting the same in mesh with said gear, the parts being so disposed with respect to each other that when said pinion is in mesh with said gear, the axes of said pinion and the said shafts will be in substantial alignment with each other so that when said pinion is the driving element the tendency is to maintain it in mesh with said gear by the driving action thereof and when said gear is the driving element the tendency is to throw said pinion out of mesh therewith by the driving action of said gear.



110,967. The design and construction of valve gear for internal combustion engines of the Vee type fitted to aircraft shown in the accompanying figure has been patented by Messrs. A. E. Berriman and the Daimler Co., Patent No. 110,967, and the inlet and exhaust are actuated from a common cam shaft located low down in the Vee, by overhead levers mounted on a spindle inclined to the axis of the cam shaft. This inclined spindle is shown at "A," and the inlet valves "B" are actuated by the lever "C," the exhaust vales "D" being operated by the lever "E." The ends of the levers are engaged by driving rods and are in a plane containing the axis of the cam shaft.

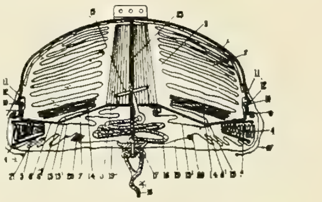


111,178. An apparatus for use in assembling aeroplane wings, comprising a stand and a framework, on which the wings are secured in correct relative position, and the framework pivoted on the stand so that the wings may be held in a substantially vertical position at the ground level to be stayed, wired, fitted, etc., and can then be carried to a substantially horizontal position at the correct height for securing to the aeroplane body, is illustrated, and Patent No. 111,178 has been granted to Mr. H. T. Williams for same. The stand is shown at "A," and the framework "B" is pivoted to same, with the wings "C" and "D" secured to the framework. Separate apparatus are provided for right- and left-hand wings, the frameworks "B" being interchangeable on the stands "A," and the apparatus may be arranged to deal with the wings of mono-, bi-, tri-, or multi-planes. The framework "B" comprises a pair of front bars "E," each provided with top and bottom bars "F" and "G," stayed by pillars "H," and connected by ply boards. Seatings "J" are provided on the front bars "F" for the edge of the wing "C," and the pillars "H" form an abutment for the wing "D." The upper surfaces of the top and bottom bars "F" and "G" are positioned so as to carry the wings the correct distance apart and at the correct inclinations, longitudinally and transversely. Hand-operated clamping levers "K" are provided at the rear of each top and bottom bar. The bottom bars "G" are carried by a platform pivoted on the stand "A" and operated by an endless cable passing round a hand-operated winding-drum "L" on the stand "A" and attached to a segmental drum on the platform.



1,263,372. PARACHUTE. EVERARD RICHARD CALTHROP, London, England. Filed Mar. 27, 1917. Serial No. 157,854. (Cl. 244—21.)

4. In a parachute launching device the combination of a container for receiving the main parachute in a compactly folded and plaited condition a support detachably connected to said container a trough and shaped member on said support adapted to receive the auxiliary parachute also in a compactly folded and plaited condition a cage on said support about which the folded and plaited main parachute is arranged when packed a center piece connections or tapes between said center piece and the main parachute and the plate pertaining to the aforesaid support a member for the connections or tapes pertaining to the auxiliary parachute and a connection between said member and the center piece.



1,264,152. AEROPLANE. ERNEST G. BRIGGS, Brookville, Pa. Filed Aug. 1, 1916. Serial No. 112,586. (Cl. 244—14.)

In an aeroplane, a body, a main plane projecting from each side of and beneath the body, supporting bases secured on the upper surface of said plane at each side of, and equi-distant from, the body, vertical shafts rotatably supported by said bases, flat circular planes secured on the upper ends of said shafts, a motor carried by the body, and driving connections between said motor and shafts for causing simultaneous rotation of the shafts in opposite direction whereby the planes mounted at the upper ends of said shafts will be rotated oppositely simultaneously and in a plane above the said main plane so as to resist forces tending to cause rocking of the aeroplane about the longitudinal axis of said body

FOREIGN NEWS

BELGIUM

According to advices received in Washington Sub-Lieutenant Willy Coppens, a Belgian aviator, earned his ninth and tenth victory in less than six weeks in the course of a few moments.

Coppens set fire to a German "Drachen" balloon flying above the woods at Ploegsteert and then downed an enemy biplane which attacked as he was returning to the Belgian lines.

FRANCE

A report from French Headquarters on June 25th reads:

"On June 23 five enemy aeroplanes were brought down or forced to land in a damaged condition. Fifteen tons of projectiles were dropped on aviation grounds in Picardy along the Aisne and on bivouacs in the neighborhood of Chaulnes and Montdidier.

"On June 24 six enemy machines were brought down or fell in a damaged condition. More than four tons of projectiles were dropped on aviation grounds in the Aisne region."

The text of the War Office statement of June 26th reads:

"On June 25, twenty-two enemy machines were brought down or forced to land in a damaged condition. Three Drachen balloons were burned. Our bombing planes in the night and day dropped more than seventeen tons of projectiles on aviation grounds, bivouacs, cantonments, and munitions depots in the battle zone. Explosions and fires were observed."

An official statement issued early on June 27th says:

"Last night several groups of enemy aeroplanes were perceived coming in the direction of Paris. An alarm was given at 11:16 o'clock. The aerial defences went into action and the anti-aircraft batteries threw up a violent curtain of fire.

"Several bombs were dropped causing material damage.

"'All Clear' was given at 12:35 a.m. Thursday."

On the night of June 27-28 several squadrons of enemy aeroplanes penetrated the defences of the Paris district last night. Anti-aircraft batteries violently shelled them.

Several bombs were dropped and material damage was done. There were few victims.

The alarm was sounded at 10:39 p.m. and the "all clear" signal at 12:05 a.m.

GREAT BRITAIN

The British official report on aerial operations issued June 24th says:

"In the strong winds and low clouds of June 23 our aeroplanes carried on reconnoissance work and artillery co-operation with difficulty. There was little aerial fighting. One hostile machine was destroyed during the day; two of our machines failed to return.

"Five tons of bombs were dropped by us during the day and fifteen tons on the following night, over six tons falling on sidings and stations at Cambrai with good effect. One of our night-flying machines is missing.

"Sunday evening our bombing squadrons carried out a series of attacks on the Metz-Sablons station. Three raids were made during the early evening, and a fourth after nightfall. Over six tons of bombs were dropped on this objective.

"Our formations were attacked by enemy aeroplanes, one of which was sent down in flames and another driven down out of control. All of our machines returned."

According to a dispatch from British Headquarters on June 25th, confirmation has been received from German sources regarding the losses of German machines in the air raid over London on May 19 and 20. In addition to seven of the squadron, numbering twenty, which are known to have been brought down, it now appears that three more machines crashed on landing.

The British statement for June 26th says:

"On the morning of June 25 attacks were carried out by our bombing squadrons on the railway sidings and factories at Saarbruecken, the engine sheds and barracks at Offenburg and the explosive factory and railway station at Karlsruhe. Many direct hits were observed on the engine sheds at Offenburg, and also on the barracks there.

"At Karlsruhe two direct hits were observed on the engine sheds and on the Metallurgique Works, where a large explosion was caused.

"Photographs confirm the extent of the damage in the two places. The factories and station at Saarbruecken also were damaged.

"A number of reconnoissances also were carried out and photographs taken.

"In air fighting ten enemy aeroplanes were destroyed and four driven down out of control. Seven of our machines are missing.

"The total of bombs dropped during the day and night amounted to ten tons."

An official communication on aerial operations issued June 27th says:

"Seven German machines were brought down by our airmen on June 26, and two others were driven down out of control. Two of our aeroplanes are missing.

"Our bombing machines dropped fourteen and one-half tons of explosives on enemy railway stations, dumps, transports and billets and on the Bruges docks.

"On the night of June 26-27 bombing operations continued, and sixteen tons of bombs were dropped by our night flying machines on various targets. Our aeroplanes attacked the chemical works at Ludwigshafen, the factories and railway sidings at Saarbruecken and the aerodrome at Bolchen. Several bombs fell on an active furnace at Saarbruecken. At the Bolchen aerodrome two hangars were set on fire, and also one machine, which was out on the aerodrome.

"All our machines returned safely. One of our machines, which yesterday was reported missing, has since returned.

"The enemy bombed one of our aerodromes during the night. No damage was done to our aeroplanes."

"In our home waters, notwithstanding the handicap of fog, numerous anti-submarine flights were made, hostile aircraft were attacked and the escorting of shipping was carried out by our seaplanes, airships and aeroplanes. Submarines were sighted and bombed and enemy mines were located on a number of occasions.

"In Mediterranean waters enemy submarines also have been sighted and attacked and enemy mines were located, and Allied and neutral shipping was convoyed. During the same period aircraft attached to the British Ægean squadron bombed aerodromes of the enemy at Drama, and other places in the Dardanelles were attacked. Two of the enemy's fighting scouts were downed in flames."

GERMANY

The German communique of June 26th said:

"Five aeroplanes were shot down out of an enemy squadron which on Monday flew from south of Soissons to the Aisne to drop bombs. Altogether twelve enemy machines and three captive balloons were brought down."

The official communication for June 27th from general headquarters says:

"Five aeroplanes were shot down out of an enemy bombing echelon, which during the last two days has raided Karlsruhe and Offenburg, an industrial region of Lorraine. Yesterday our bombing squadrons attacked Paris and the enemy's railway junctions and aerodromes on the way there."

HOLLAND

A mob of Dutch fishermen attacked a hotel on June 14 in which German airmen were interned, as the result of a submarine shelling the lifeboats of a Dutch lugger sunk without warning. The Germans were saved by the police.

A dispatch from Amsterdam dated June 20 says:

"First Lieutenant Loerzer, one of Germany's most famous air squadron leaders, has been wounded, the "Cologne Gazette" reports.

"Lieutenant Loerzer is credited with having won thirty-three air encounters, for which he received the Order Pour le Merite.

ITALY

Italian seaplanes have visited the scene of the action Monday where two Austrian battleships were torpedoed by two Italian torpedo boats and have found wreckage a mile square ten miles north of where the attack too place, having been carried there by the currents. Many dead sailors also were seen in the water and Austrian destroyers were discovered towing another destroyer along the coast.

The seaplanes also visited the harbor of Pola and ascertained that there is only one Austrian dreadnought there. As there is no other dreadnought afloat anywhere in the Adriatic, Commanded Rizzo and his companions feel satisfied that they sank both the Austrian warships.

Italy issued the following on June 16th:

"Three Austrian aeroplanes were brought down over the Piave to-day by one Italian flier."

An Italian statement of June 17th says:

"The aviation service has continued to take a very important part in the fighting, notwithstanding the unfavorable flying conditions. Forty-four enemy machines have been brought down during the last two days."

The Italian statement issued June 19 said:

"The number of enemy aeroplanes brought down now amounts to fifty. Two of our own or Allied machines are missing."

The Italian official for June 20 is as follows:

"From dawn to sunset our own and allied airmen and the seaplanes of the Italian Royal Navy were all active in chasing and not allowing the enemy to approach our lines for observation or for other aims. Our machines carried out bombardments, attacked the enemy with machine gun fire, and participated uninterruptedly and effectively in the battle.

"Fourteen enemy machines were brought down. One of our airmen did not return. Along the whole front our observation balloons co-operated usefully and courageously."

The text of the Italian War Office statement of June 25th reads:

"During the day yesterday and last night our aeroplanes carried out effective bombardments. On June 23 and 24 nine enemy machines were brought down."

The statement issued by the Italian War Office on June 26th said:

"Our flights dropped several tons of bombs on enemy ammunition dumps on the Venetian Plain and on railway establishments at Mattarello.

"Seven hostile machines were brought down. Lieutenant Flavio Baracchini obtained his thirty-first victory."

Chaplain Tells King of Studied Atrocities of Teuton Flyers

King George, learning that the chaplain of a British hospital in France which was marked by the Germans for attack was in London, sent a messenger to the chaplain asking him to call at the palece.

The chaplain said that two enemy machines first came over the hospital and dropped three bombs, two of which were explosive and fell in the outer wards, while the third was a large incendiary bomb, which dropped in the middle of the building, starting a fire.

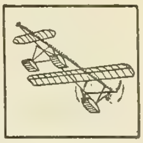
No sooner had the fire broken out than one of the German machines returned and, flying low, commenced to fire with machine guns upon nurses and men who were rescuing the wounded.

The chaplain was emphatic in his statement that the Germans could not possibly have mistaken the building, and at the King's request he illustrated his words by diagrams of the locality.

King George expressed his abhorrence of the outrage and asked the chaplain to convey his sympathy to those injured in the attack.

MODEL NEWS

Edited by John F. McMahon



Model Aeroplane Building as a Step to Aeronautical Engineering

THE general appearance of flying models changes each year, as the accompanying records will show, and of course the records increase in proportion to the efficiency of the design.

The model shown at the top is the first record holder in the United States and was built by Percy Pierce, now a lieutenant in the Aviation Section. The record of this model was something like 200 feet or so. This is wonderful when you think of the primitive methods used in those days when aeroplane flight was still a mystery. The record today is close on to a mile with a duration of 207 seconds.

The Pierce model was about 24 inches long of the single propeller pusher type, and the main plane had a spread of 24 inches. The covering was lining sewed on to the rattan wing forms. The propeller was of the high speed type and 8 inches diameter.

The Page model of 1910 was a new idea in model design, while the twin propeller idea was copied from British machines of that time; the wings were mere slats 2 inches chord and 24 inches in width. The model was very light and traveled at tremendous speed attaining great heights when in flight. The propellers were small in diameter and revolved at tremendous speed. The model was 48 inches long and the propellers were driven by three strands of one-eighth inch square rubber.

In 1911 Cecil Peoli made a wonderful record with a new type of model having a sort of "A" frame. He believed that a wing pointed at the ends served to stabilize the machine when in flight, and built his model accordingly. This model made a record of 1,691 feet at Van Cortlandt Park, New York City.

The next model was a surprise to model builders in 1912. When the author appeared with this machine he was laughed at. The other flyers said that a machine with such wing surface 24 by 5 inches and propellers 10 inches in diameter would not do much as a record-breaker, but one fine day it did go 2,003 feet and the propellers revolved so slowly that you could almost count the revolutions in the air.

This was the forerunner of the large surface slow speed type and the model of today resembles it a great deal, only a few changes as to light weight and refinement of details.

The frame of this model was made of two sticks of Balsa wood 36 inches long and tapering from three-quarter inch at the middle to one-half inch at the ends. Balsa wood is as light as cork but has very little strength. The propellers were driven by four strands of one-eighth inch square rubber.

The Selley model was another surprise. The propellers were of extremely high pitch, being cut from a blank 2 inches deep and 1 inch wide. In the air they revolved very slowly about 600 revolutions per minute and the model never flew more than 40 feet from the ground. Selley's record was 2,800 feet. When fitted with pontoons it made a record of 53 seconds duration rising from the water. This was more than double the English record of that time.

The model made by Wallace Lander resembled the other types a good deal, but the construction was very light. The wings were double surfaced and covered with gold-beaters skin. The construction of the wings was of the thinnest bamboo strips and weighed three-quarter ounce. The frame was 42 inches long. The sticks were one-quarter inch thick at their widest portion and tapered to three-sixteenth inch.

From this we see that the successful model is the one that is light and carefully designed. The Ward Pease model which is the record holder today weighs less than two ounces.

(*To be continued*)

Illinois Model Aero Club R. O. G. Duration Contest

On June 16 the Illinois Model Aero Club held an R. O. G. Duration contest at which some very fine flying was done. The best average as well as the best flights were made by Wm. Schweitzer. The three official flights of the leading competitors were as follows:

Wm. Schweitzer.......	137 secs.	126 secs.	15 secs.
J. Krawiec.............	98 secs.	96 secs.	15 secs.

After the official flights were completed the boys removed their chassis and attempted to improve their hand launched records. Some very fine flights were made in this way. Davies made flights of 105, 40 and 170 seconds. Krawiec made 101 and 108 seconds.

The climax of a day of good flying came when Wm. Schweitzer had an official flight of 230.8 seconds, thus breaking the world's record of 207 seconds held by Ward Pease, also of this club. The model was of the same general type of twin pusher as is generally used by the Illinois boys but with a refinement of details of design and construction, to which, no doubt, its superior flights can be attributed.

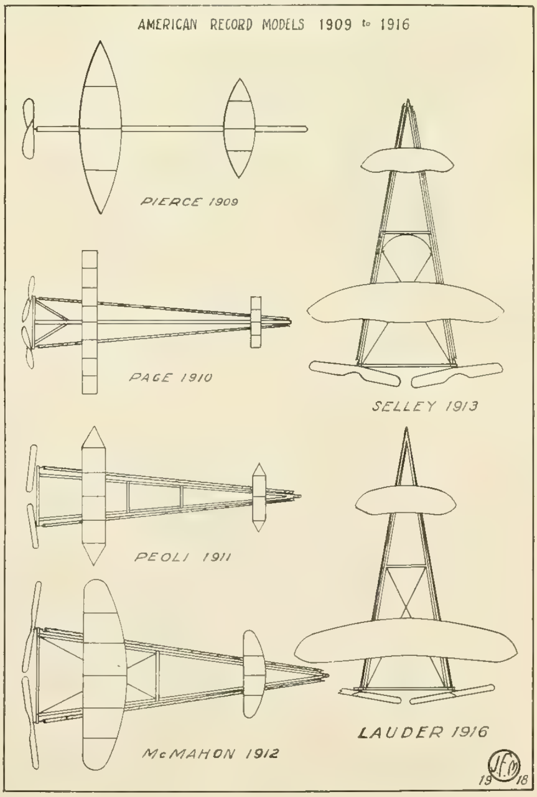
The model was 36 inches long, weighed 1.96 ounces and was driven by four strands of 3/16" flat rubber turning thirteen inch propellers.

The members of the club intend to make particular efforts to break the R.O.G. Duration record in the near future, as this in the only record not held by this club.

Illinois Model Aero Club to Hold Contests

The Illinois Model Aero Club has arranged a series of contests for the year in competition for the Laird-Weaver Trophy. This cup is awarded annually to the flyer having the best average for the year. Last year it was won by William Sprague with William Schweitzer a very close second. The schedule for the year is as follows:

June	2	R. O. G. Distance
"	16	R. O. G. Duration
"	30	R. O. G. Duration
July	14	Hydro Duration
"	28	Hydro Duration
Aug.	11	Hand Launched Duration
"	18	Hydro Duration
Sept.	1	R. O. G. Tractor Duration and Distance
"	15	R. O. G. Duration
"	29	R. O. G. Distance
Oct.	13	Hand Launched Distance
"	27	Hand Launched Distance



Aeronitis

Aeronitis is a pleasant, a decidedly infectious ailment, which makes its victims "flighty," mentally and physically. At times it has a pathologic, at times merely a psychologic foundation. It already has affected thousands; it will get the rest of the world in time. Its symptoms vary in each case and each victim has a different story to tell. When you finish this column YOU may be infected, and may have a story all of your own. If so, your contribution will be welcomed by your fellow AERONUTS. Initials of contributor will be printed when requested.

Right!

"Explain the meaning of celerity," commanded the teacher. "It's what you get out from under a falling aeroplane with," answered the young hopeful who had been reading aeronautical literature.

Times Do Change

Spring is here in all its glory,
Filled with sweetness is the air,
Painted green are all the meadows
And the birds sing everywhere.

So begins a poem written
In the Ozarks far away,
As I watched a Maltese kitten
Roll upon the lawn at play.

"Times do change," so goes a saying,
And believe me, it is true,
For the spring in all its glory
Now presents a different hue.

I am stationed on the beaches
Keeping seaplanes in the sky;
With my pockets full of wrenches,
Glad that our machines will fly.

Here one comes down in a spiral,
Skims the water through the spray,
Heads toward the signal given
On the beach of Great South Bay.

Men in boots wade out to meet her
And we fast her with a line;
"How's she running, Mr. Pilot?"
And he yells back, "going fine."

And we make a quick inspection,
Add some gasoline and oil,
Fill the water radiators,
Shove the pontoons from the soil.

And the motor starts to humming,
And we turn her nose to sea;
"All is clear," we tell the pilot,
And he signals "set her free."

And the whirl of the propeller
Blows the sand into our eyes,
As she skims across the water
Once again toward the skies.

Spring is here in all its glory,
Filled with seaplanes is the air,
And we stand with upturned faces
Hearing motors everywhere.

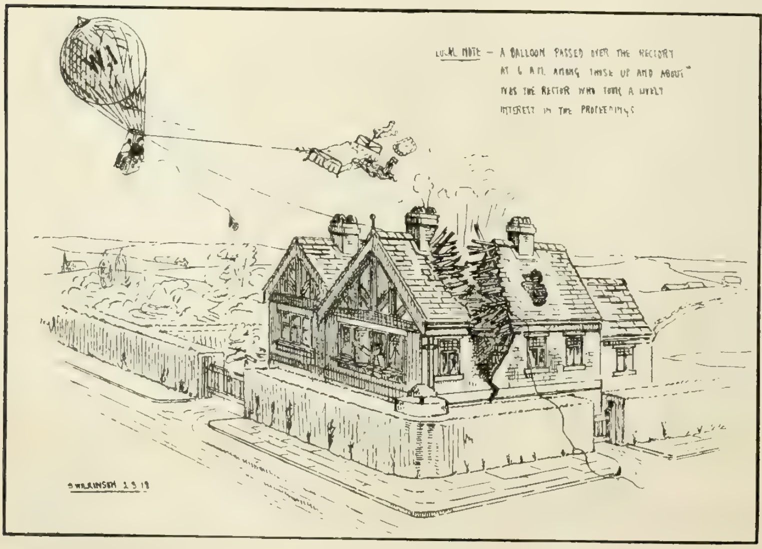
FARRAR BURN,
U. S. Naval Air Station, Bay Shore.

Limericks

Large and marvellous is the Caproni,
Even young ones appear over-growni.
If they get any bigger,
What price the poor rigger!
Unless they are braced by Marconi.

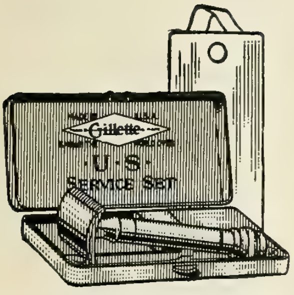
A pilot who'd learnt on a Blériot.
Always thought he was rather a heriot,
Till someone cried "Steaduet,
I learnt on a Breguet."
Then his pride sank to somewhere near Zeriot.

Whilst rigging a 'bus, an A.M.
Said, "Golly, this 'bus is a gem,
Gott strafe its designer,
I cannot align 'er,
I must wangle the angle *pro. tem.*"

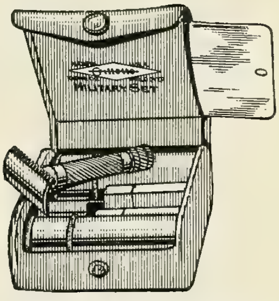

LOCAL NOTE — A BALLOON PASSED OVER THE RECTORY AT 6 A.M. AMONG THOSE UP AND ABOUT WAS THE RECTOR WHO TOOK A LIVELY INTEREST IN THE PROCEEDINGS
S WILKINSON 2.3.18

German bombs have again been dropped on London schools. After a while that will be the only way to get anything German into the American schools.
—Newark News.

Gillette SAFETY RAZOR



The New U. S. Service Set—A solid metal case, heavy nickel-plated and embossed with the Insignia of the U. S. Army and Navy. Strong, thin, compact: 1¼ inches wide, 4 inches long, ⅝ inch thick. 12 double-edged Gillette Blades (24 Shaving Edges). Contains a nickel-plated Gillette Safety Razor and Blade Box. Indestructible Trench Mirror inside the lid. $5



Military Set No. 18—For Uncle Sam's Officers, a Gillette Combination Set, in case of U. S. Regulation Khaki twill — nickel-plated "Bulldog" Razor; indestructible Trench Mirror fitted in pocket in lid; Shaving Brush and Stick Gillette Shaving Soap in nickel-plated Holders; two Blade Boxes; 12 double-edged Gillette Blades (24 Shaving Edges). $7

Why the Soldier Chooses the Gillette

There are mighty few personal belongings a man in the Service can pack around—and the greatest of his comforts is his Gillette.

Wind-chap, sun-burn, cold water, cold weather only give the Gillette a bigger opportunity to show *service.*

There isn't a mile of the battle-fronts, nor a ship of the Allied Nations, but has its Gillette users by the tens and the hundreds. The compact, portable razor that can always be depended on for service.

Have you seen the new Gillette Sets specially made for the fighting man? Two of them are illustrated on this page. They were designed by members of the Gillette organization in the Service — men who know what the fighting man is up against.

Simple and compact, fit in the pack, the pocket or the ditty box. No strops or hones to clutter up the kit. Blades always sharp, always ready. No Stropping—No Honing. When a man wants new Blades he can get them in any Post Exchange, Ship's Canteen, or Y. M. C. A. Hut, here in America or overseas.

Our Paris Office carries stocks — is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy, and the Eastern battle fronts.

Gillette Safety Razor Co.
of Canada, Ltd.
73 St. Alexander St.
Montreal

Gillette Safety Razor Societe
Anonyme
17 Bis, Rue La Boetie
Paris, France

Here's the Way to Get 100% Efficiency Out of Your Gillette

Try this when you shave tomorrow morning. Lather the beard thoroughly, and rub well in — that's essential with any shave.

Put in a new blade and screw the handle down tight. If you want a specially close shave, unscrew the handle a part turn.

Hold the razor naturally and easily, and tilt the handle so you can just feel the blade engage the beard.

Then shave with short slanting strokes. It doesn't require any brute force to shave with a Gillette—the razor does the work.

Gillette Safety Razor, Ltd.
200 Great Portland St.
London, W., England

A. G. Micheles
53 Liteiny, Petrograd, Russia

Vedova Tosi Quirino & Figli
Via Senato, 18
Milan, Italy

Gillette Safety Razor Company
Boston Mass·U·S·A·

A THOUSAND

willing workers made it possible for this powerful aeroplane to take to the skies to help win the war in the Air for the Allies.

The American Air Program is a stupendous task and its success depends on the efficient co-operation of every organization that can devote machines and man-hours to the task.

Ask our Contract Work Department how you can help.

Aerial Age Weekly

280 MADISON AVENUE
NEW YORK CITY

(*Continued from page* 832)

Power

Indianapolis has an inexhaustible supply of steam coal at her very door—Indiana mines being within sixty miles, delivering coal by three lines of railroad. Indiana stands fifth in the total quantity of coal mined in a list of twenty-eight coal-producing States. Indiana steam coal ranks with the best of the middle-western coal in British thermal heat units. The average is 11,697 heat units, and some of the Indiana coal yields as much as 12,325 heat units. The State geologist says there are 50,000,000,000 tons of this coal and that it will last 180 years at the present rate of consumption. Two competing companies furnish electric current at rates that compare favorably with cities enjoying water power in the manufacture of electricity. Artificial gas is sold for domestic purposes at 55 cents a thousand cubic feet and at a much lower rate to large users—one of the lowest rates in the United States.

Raw Materials

Indianapolis is a natural base for most sources of raw materials. No city has near its gates every form of raw material. Each city has some and Indianapolis has its share. The observant manufacturer will see at once that the very conditions which make Indianapolis dominant as the center of the country's market, together with the city's shipping facilities, solve the problem of raw material. Since Indianapolis is nearer than any other city to every possible customer in the United States, it is likewise nearest to all existing raw materials. And being nearer, and having competitive shipping facilities in all directions, Indianapolis is the natural base from which to draw quickly and economically on the sources of raw material.

Living Conditions

Indianapolis is best known as a city of homes. There is practically no slum district and few tenement houses. The workers for the most part live in cottages under wholesome and sanitary conditions. There are 1,752 acres of parks scattered through all parts of the city and fourteen special recreation playgrounds maintained by the city during the summer months, in addition to 59 tennis courts, 22 baseball fields and 3 municipal golf links. There are 292 churches, 76 public school buildings, 3 high school buildings, 21 parochial schools, 24 colleges (including classical, medical, law and dental) and 19 branch libraries, besides the new central public library. The various social agencies in Indianapolis exert an unusually helpful influence in the community and help to make the city one of the most attractive places in the whole country in which to live and rear a family.

Atlanta Offers Aviation Inducements

By D. C. Lawhon, Assistant Secretary, Atlanta Chamber of Commerce

ATLANTA is the central location for any industrial development in the Southeastern territory, and its excellent climate makes it especially suitable for the location of aircraft factories.

The city is located upon a ridge, the backbone of the Blue Ridge Mountains, and is 1,050 feet above the sea level. It has a bracing climate, without great extremes of heat or cold.

The southern headquarters of many northern and eastern manufacturing concerns are located in Atlanta; there being about four hundred manufacturers' agents in the city.

It is the center of vast activity on the part of the Government, which has twelve cantonments in this section, with about 400,000 troops

Camp Gordon is one of the greatest cantonments built by the Government, at a cost of about six million dollars and occupied by a division. It is believed that these quarters will be largely increased, and the Government is now taking steps to secure additional land. Atlanta will probably become the center for some 50,000 or 60,000 troops in the near future.

As the Government is acting upon the necessity of the case and not upon favoritism for any city, it will be seen that the location at this point of important enterprises by the Government is based upon merit and the advantages of Atlanta as a center.

There are a number of available properties about Atlanta that could be utilized for factory sites and landing fields; some grading, of course, being necessary to put the fields in proper condition. The clay soil of Georgia packs firm and smooth. The Southeastern Fair, a permanent institution located in this city, possesses one of the best mile race courses in the South, this tract being of clay.

The population of the city to-day is 240,00 and there are 243 miles of street railway, with an excellent system of transfers, enabling the movement of labor to and from all outlying sections.

One secret of Atlanta's remarkable growth is to be found in

To build a weapon of the skies, invincible as Jove's Great Thunderbolt of old—that is the work to which our all is dedicated.

A REAL FIGHTING INDUSTRY
Elizabeth, New Jersey

Member of Manufacturers' Aircraft Association, Inc.

the fact that the people pull together on all questions that affect the prosperity of the city. They have a splendid civic pride, which is known as the "Atlanta Spirit." In great crises an appeal to the "Atlanta Spirit" is never heard in vain. The business and professional men of Atlanta give more of their time and money to public work than those of almost any other community in the South. They are organized through the Atlanta Chamber of Commerce for all kinds of constructive work designed for the upbuilding of the city or improvement of the conditions of life and business.

Atlanta is the center of great war activity on the part of the United States Government. In addition to Camp Gordon mentioned before there has been located in Atlanta the following Government institutions:

The Supply Depot for the Southeast.

The Medical Supply Depot for the Southeast.

A general hospital for the Southeast.

A Regional Bank for Georgia, Florida, Alabama, Mississippi and Tennessee.

The Regional Director of Railroads for the Southeast, controlling an immense traffic in this region.

Headquarters of the Railway Mail Service for the Southeast.

An aviation school with 600 students.

The Government Repair Shop now being erected at a cost of about two million dollars, to employ about 1,500 men, engaged in repairing motors, machinery and all sorts of articles for the cantonments of the Southeast.

The Government Reclamation Works repairing clothing, shoes, hats, tents and other articles. We are informed that these works will employ about 2,500 persons. The Government is now negotiating for a building in which to establish this factory and will start it at the earliest possible moment. A large volume of work is already consigned to Atlanta and awaiting repairs by these works.

A Remount Comp in connection with Camp Gordon.

An artillery range twenty miles from Camp Gordon and to be connected with that camp by a military road.

A rifle range about fifteen miles from Camp Gordon and to be connected by a military road.

Inquiries regarding Atlanta as a location for aircraft and other factories should be addressed to the Atlanta Chamber of Commerce.

We have received two notices from the Government:

1. Your application for a license to fly is disapproved.

2. Since your Penguin does not leave the ground there is nothing to stop the use of them.

Wherefore,

YOU MAY LEARN TO FLY
BY THE
BEECH FLIGHT SYSTEM

PROCEDURE:

You apply for a license for the purpose of making practice flights on Salt Plains, Okla., to The Joint Army & Navy Board for Aeronautic Cognizance, 1607 H Street, N.W., Washington, D. C.

You then pay us a fee of $125 for which we prepare you to the point where you may safely go up alone in our airplane, which we rent you for 65c each minute of actual flight, including the cost of breakage, with the proviso that you follow our instructions, because while our Penguin is harder to handle on the ground than an airplane is in the air in normal weather, there remains the principles of the landing to teach, which is easy by our system providing instructions are followed.

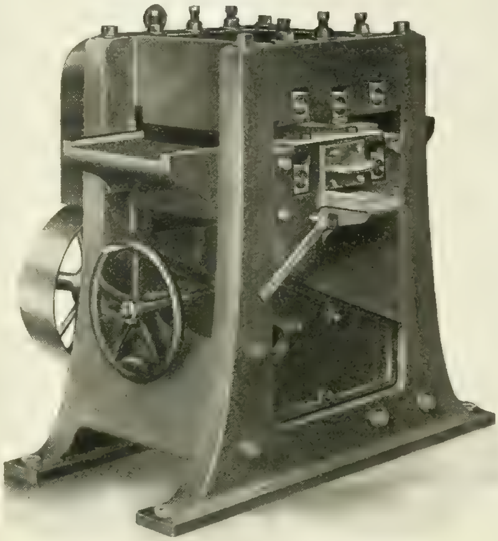
Address

THE BEECH FLIGHT SYSTEM CORPORATION
Cherokee, Okla.
Pioneer aviator A. C. Beech, President.

Aeroplane Propeller Stock

Toothed at the rate of 100 feet per minute by running it through a

WHITNEY
Toothing Machine


Whitney Scraping and Toothing Machine

If you want to prepare your Propeller stock before gluing up by the quickest—easiest—safest and cheapest method, just put it through a Whitney Toothing Machine.

Many of the Aeroplane Manufacturers, as well as Propeller Makers, are using this machine.

It will pay you to investigate.

**Write for catalog
and samples of toothing**

Baxter D. Whitney & Son
WINCHENDON **MASSACHUSETTS**

(*Continued from page* 831)

Travis, William Seybold	SLR: DAP
Trueheart, James Overton	SLR: PMT
Thresher, Ebenezer S.	PWM
Taylor, Arthur W	SMM
Truitt, Leon Olover	SLR, CGC
Thomas, William G	LHV
Thompson, Roland S.	EOT
Tenhope, Jerry J.	SLR: AAD
Thomas, Charles E.	PFO
Taylor, Marvin H	FRF
Tyree, John Wade	SLR
Taylor, Alfred B.	DIK, FRF
Trantham, Homer	WFO
Tips, Eugene C.	WFO
Tupper, Preston E.	WFO
Taylor, Howard Story	SLR, PFO
Todd, Edwin T.	WFO
Tillisch, William H	FRF
Thompson, Arthur F	WFO
Telfair, John Chandler	SLR: WAC
Turrill, Gardner Stilson	SLR, KST
Toppan, Cushing	KST
Turner, Homer H.	KST
Taylor, John A.	DIK
Talbot, Elmer R.	DIK
Taylor, Alfred Bucklieur	SLR: CAF
Traughber, Jesse Douglas	SLR: CGC

V

Vincent, John H	SMM
Valentine, Allen W.	TFT
Vendig, Morales Casseres	SLR, PFO
Vogt, Edward Charles	SLR: KST
Venton, Wilson L	WFO
Vinton, Benjamin	WFO
Vandermeer, Dirk J	FRF

W

Wilson, Frank G	FRF
Walrath, Duane E	FRF
Wilford, Robert Nicholas	SLR RWT
Wood, Harold Burroughs	SLR, GLC
Westall, William Henry	SLR, PMT
Winters, Bert	CPR DAP
Woltz, Roscoe	FLR, DAP
Welch, Paul R	FRF
Wymond, William J.	PFO
Woolf, Douglas G	LHV
Weitekamp, Elmer J	FRF
Worth, Paul	EOT
Weddington, Harry	PWM
Wells, Harold Ralph	FRF
White, Kenneth Taylor	FLT DIK
Ways, Karl H.	PWM
Walker, Clarence R.	FRF
Welles, Charles B.	PFO
Wolf, Irwin D.	FLR
Wehrell, Albert J.	LHV
Wheeler, Sylvester L.	CAF
Wentworth, Harold S.	WFO
Webster, Lewis Selwyn	SLR; AAD
Wimer, William B.	FRF
Welch, Peter Westley	SLR; RSD
Whitehead, Eugene Cunningham	SLR; PFO
Weiser, Victor Albert	SLR; AAD
Werner, Raymond E.	SLT; PFO
Wolff, Charles	SLT; PFO
Williams, Stanley T.	DMA
Ward, Peter Garner	SLR; PFO
West, Norman Stewart	SLR; KST
Worrell, Willard Parker	SLR; KST
White, Zebulon L.	CAF
Wood, Walter C.	CAF
Wiley, Esmond Fenton	SLR; RSD
Wilson, Guy H.	SLR; DIK
Williamson, Cleburne Milton	SLR; KST
Williams, William Pearce	SLR; RSD
Whitman, John B.	WFO
Walthall, Leroy A.	DIK
Wiley, Barton L.	CRI
Wendell, Lay A	WFO
Williamson, James C.	WFO
Winkle, William E.	WFO
Whitten, Lacey R.	WFO
Wait, Harry W	WFO
Whiting, Bryan F.	WFO
Wagner, Albert G.	VBW
Webster, William P.	WFO
Wagoner, George A	WFO
Waite, Eugene, Jr.	SLR: KST
Wright, Oscar Catlette.	SLR; GLC
Williams, Paul Beauchamp	SLR: RDT
Wing, Leo	SLR, KST
Wendt, Carl Albert	SLR
Worthen, Charles Bertrand	Note 16
Walton, Lester Roberts	FLR, DAP

Y

York, Duke A.	DIK
Yackey, Wilfred A., Jr.	LHV
Young, George E.	PWM
York, Philip S	WFO
Younger, John E.	WFO

Z

Zingermann, Ernest Louis	SLR: RWT

(*Continued from page* 821)

defects only developed after long trial in the air; new types of aeroplanes favorably reported on when first tried are found on longer experience not to give complete satisfaction, and yet is is impossible, if we are to keep ahead in the keen struggle for aerial superiority, to wait for full experience before placing orders. Risks must be run, and new types must be adopted at the earliest moment consistent with reasonable assurance that they will constitute a substantial improvement on what is already in use. Orders must be placed, moreover, for considerable numbers and for delivery over many months, as the large output required for our present flying services can only be obtained by bulk orders permitting a high degree of sub-division of work.

The next step in the problem is the balancing of the engine and the aeroplane programmes. Owing to the much longer period required for the production of engines than of aeroplanes, orders for the former must be placed for relatively long periods ahead, before it is known what types of aeroplanes will be required when the engines become available.

The problem is complicated by the fact that manufacture and delivery rarely if ever proceed in accordance with anticipation. The output of a particular type may be delayed for weeks or even months owing to some technical difficulty of manufacture. Moreover, as replacement of losses and expansion are proceding simultaneously in the flying services, and the rate of wastage in different types of engines and of aeroplanes varies considerably according to circumstances, it is impossible to forecast with accuracy what engines will be available for the equipment of new types of aeroplanes after wastage has been made good. Nor is it possible to any great extent to adjust the programme by modifying orders once placed without disorganizing supply. The

(*Continued on page* 842)

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(*Continued from page* 840)

problem does not end here. Whenever a new type is introduced provision must be made for accumulating a sufficient "head" of spare engines, spare aeroplanes and spare parts of innumerable kinds, to keep the squadron to be equipped with that type in a condition to make good the day-to-day wastage and carry out the constant repairs required.

Such being the nature of the problem, it is satisfactory to be able to record that during the year 1917 not only was the number of squadrons of aircraft on the various fronts increased in a notable degree, but there was a complete replacement of machines and engines of the older types. The very great increase in output which is being obtained has placed a considerable strain on the workers in the aircraft and aero-engine factories of the country, a strain which is being met on the whole in a satisfactory manner.

The difficulties in connection with production are aggravated by the competing claims of many different types of aero-engines. Standardization is the ideal but it is obviously difficult of attainment having in view the importance of not losing time in production and at the same time of keeping abreast with the very latest developments necessitated by the need for constant increase of horsepower and higher performance. The Air Council are most keenly impressed by the need for concentration on a few approved engines, and they have the whole question of the reduction of numbers of types under constant and careful considration.

Attention was drawn, on more than one occasion, by manufacturers to the importance of maintaining the interest of workers in aircraft factories in the highly important but generally monotonous work on which they are employed. Engaged, as they frequently are, on the production by a repetition process of some small part of an aeroplane, these men and women find it difficult to realize that they are contributing effectively to one of our most valuable instruments of warfare. It was accordingly arranged that Captain Ewart, R.F.A., well known as a writer by the name of "Boyd Cable," should visit various squadrons at the front and gather materials and photographs for lectures concerning the exploits performed with various types of aircraft for delivery to the workpeople engaged on the manufacture of those particular types. Captain Ewart delivered several series of lectures which, judging from the reports received from the factories concerned, proved a very great success.

Commend Naval Air Work

Washington.—The Committee of the House of Representatives appointed for investigation of conduct and administration of naval affairs, commends the naval aircraft construction work performed. That part of the report bearing upon aircraft reads as follows:

"We have examined the naval aircraft situation and find many matters of great interest, but much of our information is not now open for public discussion.

This was the one development of material which no amount of foresight would have enabled the navy to prepare adequately. The growth of aeroplanes and seaplanes has been so rapid that nothing short of actual war conditions would insure a large number of up-to-the-second machines with aviators trained to handle them.

"In the earlier stages of its undertakings the naval air service met many discouragements, but the perfection of the liberty motor and the use of large sums of money in conjunction with the army to finance manufacturers have, under the direction of the air service, produced results that now promise to meet the requirements of this important branch of the navy.

"The aircraft program is in charge of Capt. Noble E. Irwin, and we commend to the entire committee the careful reading of his hearings, and especially a recent interesting and informing report made by him, now on file with the secretary of the committee."

The report filed by Captain Irwin with the committee is not available for public information because of military reasons. The hearing of Captain Irwin by the Committee on Naval Affairs developed the following information:

The Navy Department considers it undesirable to build more rigid dirigibles and is manufacturing only the non-rigid types made of cloth, inflated like a balloon and without metal or woodwork. The fuselage of the car attached to this type is like the fulselage of a War Department aeroplane.

The rule in connection with establishment of training schools for fliers is to limit them 90 machines because more than that number creates great possibilities of collisions in the air.

The advanced training schools are separated from the preliminary training schools and include instruction in bomb dropping and gun fire.

The sizes of the aeroplanes change so frequently that new hangars have frequently to be constructed.

Propellers Coming from Milwaukee

Milwaukee.—A large plant for the manufacture of propellers for aeroplanes, hydroaeroplanes and similar craft has been established in Milwaukee by the United States Aero Propeller Co., organized by the same interests owning and operating the Great Lakes Boat Building Corp. W. C. Morehead is president and general manager of both companies, which jointly occupy the boat works and shops at 333 Becher Street, Milwaukee. The new company is working on large Government contracts both for the army and navy departments.

Coffin Examined in Aircraft Investigation

Washington.—Howard E. Coffin, recently chairman of the Aircraft Production Board, was examined by Charles E. Hughes and Assistant Attorney General Frierson at the Department of Justice, in the aircraft investigation. Mr. Coffin's examination occupied most of the day, and Attorney General Gregory himself was present the greater part of the time. Neither Mr. Coffin nor the investigators would discuss the inquiry. Mr. Coffin left the Department of Justice in his usual good humor, and apparently had not been seriously affected by the investigation.

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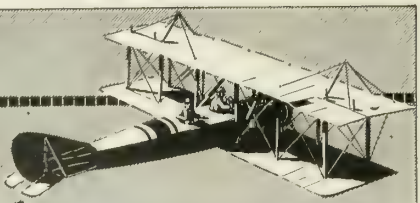

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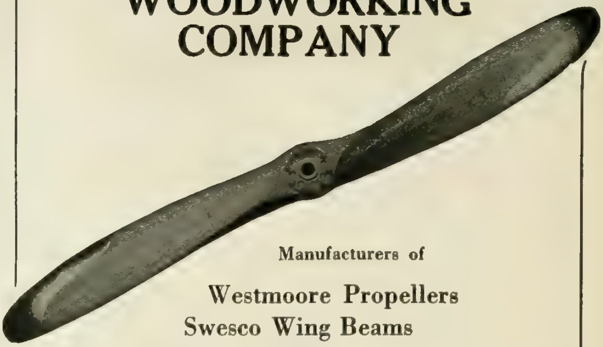

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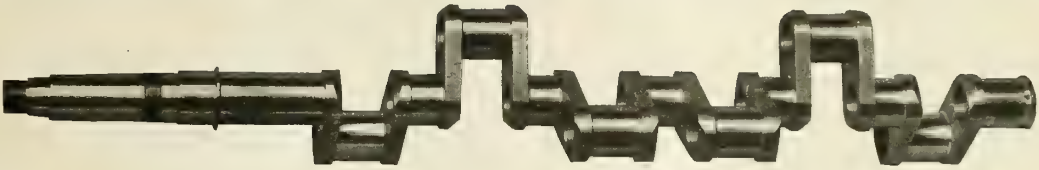

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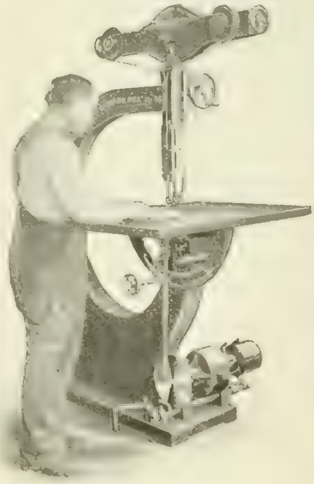

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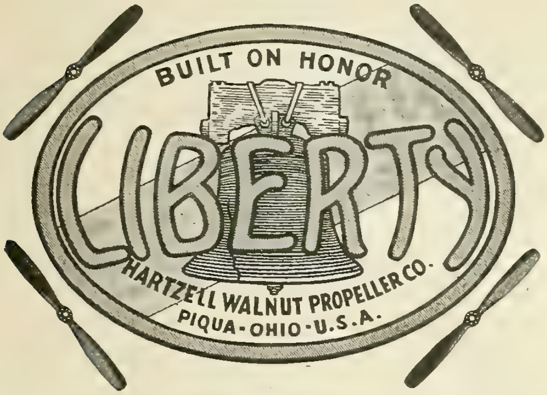
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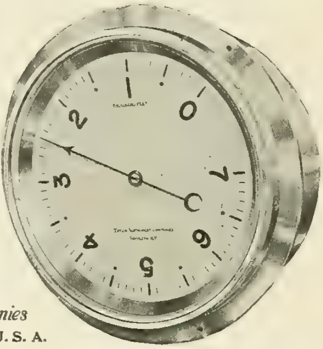

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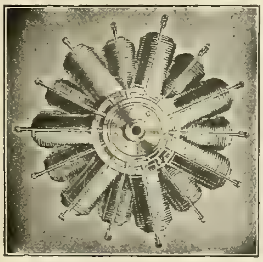

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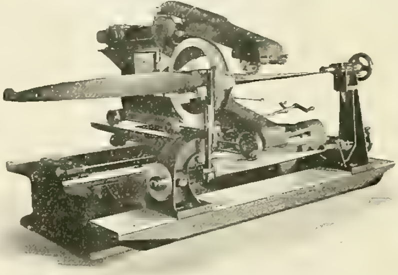

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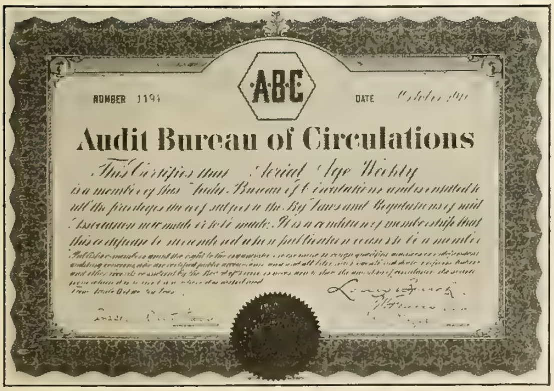

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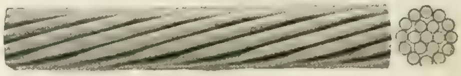

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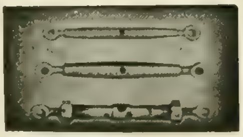

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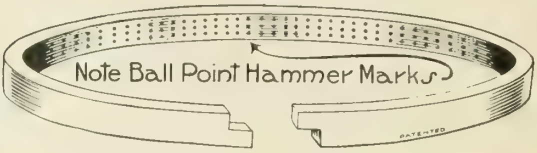
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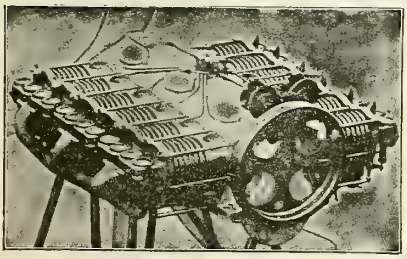

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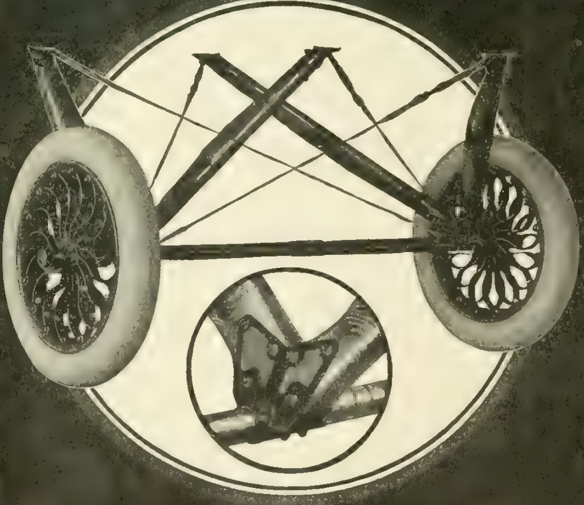

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